

CURRICULUM VITAE

ÉTAT CIVIL

- Âge : 29 ans
- Né le 26 mai 1980 à Nîmes (Gard)
- Situation : Marié, 1 enfant
- Nationalité : Française

EXPERIENCE PROFESSIONNELLE

- 2007-2009 : **Postdoctoral Research Fellow, Stanford University, USA**. Rattaché au Stanford Center for BioMedical Informatics Research (BMIR) & National Center for Biomedical Ontology (NCBO).
- 2006-2007 : **Attaché Temporaire d'Enseignement et de Recherche** (complet), Université Montpellier 3 (arts, lettres, sciences humaines). Rattaché au Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier (LIRMM).
- 2003-2006 : **Allocataire de recherche MENRT & moniteur CIES** à l'Université Montpellier 2 (UM2) (sciences et techniques). Rattaché au LIRMM.

FORMATION

- 2006 : **Doctorat en Informatique** (Men. très honorable) – UM2
Effectué sous la direction de Pr. Stefano A. Cerri dans l'équipe Kayou du LIRMM. Intitulé : « Dynamic Service Generation: Agent interactions for service exchange on the Grid »
- 2003 : **DEA Informatique** (Men. B) – UM2
Stage effectué sous la direction de Pr. Stefano A. Cerri. Intitulé : « Communication agent et interprétation Scheme pour l'apprentissage au méta-niveau »
- 2002 : **Maîtrise Informatique** (Men. AB) – UM2
- 2001 : **Licence Informatique** (Men. AB) – UM2
- 2000 : **DEUG MIAS** – UM2 – Site de Nîmes
- 1998 : **Baccalauréat Scientifique option Maths** (Men. AB) – Uzès (Gard)

RESUME DE L'ACTIVITE DE RECHERCHE

CENTRES D'INTERET

- les ontologies,
- le web sémantique,
- l'extraction d'annotations,
- la fouille de texte,
- l'informatique biomédicale,
- l'intégration de donnée,
- la recherche d'information,
- la notion de service,
- les systèmes distribués,
- les systèmes multi-agents,
- le web 2.0
- le grid,
- les communautés virtuelles,
- les langages applicatifs/fonctionnels,
- l'e-learning,
- la collaboration à distance

EQUIPES & PROJETS DE RECHERCHE

2007-2009 : Le **Stanford Center BioMedical Informatics Research (BMIR)**, dirigé par Pr. Mark A. Musen, est un laboratoire leader dans la représentation des connaissances, les ontologies (l'équipe développe l'outil Protégé), le web sémantique et leurs applications biomédicales. <http://bmir.stanford.edu/>

2007-2009 : **Projet National Center for Biomedical Ontology (NCBO)**, NIH National Centers for Biomedical Computing Roadmap. <http://www.bioontology.org/>

2003-2007 : **L'équipe Kayou (LIRMM)** est articulée autour de l'interconnexion de 3 thèmes : les agents, l'apprentissage et les contraintes pour la résolution de problèmes distribués. Mots clés : interaction, organisation, logique, service, sémantique, émergence, grille. Membres : Jacques Ferber, Christian Bessiere, Stefano Cerri, Jean Sallentin, Joel Quinqueton. <http://www.lirmm.fr/kayou/>

2004-2007 : **Projet European Learning Grid Infrastructure (ELeGI)**, IST Integrated Project EU – FP6

2003-2004 : **Projet Learning Grid of Excellence Working Group (LeGE-WG)**, IST STREP Project EU – FP6

SUJETS DE RECHERCHE

Je travaille aujourd'hui sur l'annotation automatique de données biomédicales avec des ontologies. Dans le cadre du projet NCBO nous développons une application Web, BioPortal (<http://bioportal.bioontology.org/>) qui sert à la fois de librairie pour des ontologies biomédicales mais également qui propose tout un ensemble de services à une communauté biomédicale en grand besoin de structurer et d'accéder à des quantités très importantes d'information et de données. En particulier, **je design et développe un workflow d'annotation qui permet aux chercheurs d'utiliser les ontologies biomédicales pour annoter leurs données automatiquement**. Le workflow traite les métadonnées textuelles brutes pour les taguer avec des concepts définis dans des ontologies biomédicales et utilise la connaissance représentée dans des ontologies (is_a relations, mappings, distance sémantique) pour étendre ces annotations. Nous utilisons ces annotations dans des problématiques de type intégration de données et recherche d'information.

Je suis donc aujourd'hui dans un contexte (très intéressant et très formateur) de recherche « appliqué » sur le Web sémantique et les ontologies. Ce domaine d'application (la biomédecine et l'informatique biomédicale) me donne je pense un bagage utile pour l'élaboration de futurs projets de recherche (FP7, ANR).

Dans un contexte différent, mes travaux de thèse se situaient au croisement de 3 domaines, à un niveau plus théorique : l'informatique orientée service (Web service, composants logiciels, processus d'affaires, etc.), les Systèmes Multi-Agents (modélisation, interaction, architecture) et le Grid (partage de ressources, service Grid, grille de calcul). Je propose dans ma thèse une nouvelle approche du service basée sur les conversations entre agents (humains ou artificiels) et utilisant l'infrastructure et les mécanismes de Grid. Nous avons utilisé cette approche pour développer l'adaptabilité, la composition et l'interopérabilité des services. C'est ce que l'on appelle la « **génération dynamique de service** ». Deux des contributions importantes sont : un modèle multi-agent appelé STROBE et un langage pour l'intégration des applications multi-agent et Grid (AGIL).

COLLABORATIONS

- 2007-2009 :
 - Collaborateurs & utilisateurs de la communauté NCBO e.g., Univ. of California San Francisco (Pr. Ida Sim), Medical College of Wisconsin (Pr. Simon Twigger), Wright State Univ. (Pr. Amith Sheth), <http://bioontology.org/collaboration.html>. Objectifs : permettre à ces collaborateurs (communauté biomédicale) d'utiliser les outils NCBO pour leurs problématiques scientifiques.
 - Equipe Tadoo du LIRMM, UM2 (Dr. Maguelonne Teisseire). Objectifs : enrichissement d'ontologie biomédicale à l'aide de techniques de fouille de données.

- 2003-2007 :
 - Knowledge Media Institute (KMI), Open Univ., Milton Keynes, UK (Pr. Enrico Motta, Dr. John Domingue, Pr. Mark Eisenstadt). Objectifs : enrichissement des standards des services Grid par les avancées des domaines tels que la représentation des connaissances et les ontologies et apport de l'approche agent.
 - Stanford Medical Informatics (SMI) à Stanford, CA, USA (Pr. Mark A. Musen et Dr. Monica Crubezy). Objectifs : construction collaborative d'ontologie (avec l'éditeur Protégé).
 - Université de Namur, Belgique (Pr. Alain Krief). Objectifs : Dans le cadre du projet ELeGI nous avons modélisé et implémenté un environnement de travail collaboratif basé sur une architecture de services Grid, appelé le « Grid Shared Desktop ». Cet environnement était utilisé par une communauté de chimistes pour le développement collaboratif d'une ontologie.

DEVELOPPEMENT LOGICIEL & TRANSFERT TECHNOLOGIQUE

- Design, implémentation, test et validation de 2 générations de prototypes pour l'index de ressources biomédicales (Open Biomedical Resources) et le service d'annotation (Open Biomedical Annotator) du NCBO. <http://obs.bioontology.org/>
- Design, implémentation, test et validation d'un prototype pour la nouvelle génération de services web de BioPortal et l'intégration d'UMLS (Open Biomedical Services).
- Design et supervision du déploiement d'OBS, OBA et OBR en production.
- Expérimentations de validation des aspects théoriques du modèle STROBE en Scheme.
- Plug-in STROBE pour la plateforme multi-agent MadKit (plateforme développée dans l'équipe Kayou). Technologies : Java/Scheme/Kawa
- Expérimentations du Grid Shared Desktop en situation réelle (<http://agora.lirmm.fr>).

ENCADREMENT D'ACTIVITES DE RECHERCHE

- 2007 : Co-encadrement avec Dr. Nigam Shah d'un stage de développement et de recherche d'un étudiant (Nipun Bathia) de « MSc (master) in Computer Science » de l'Université de Stanford. L'objectif de ce stage était de mener une évaluation de l'outil de reconnaissance de concept, Mgrep, que nous utilisons dans le workflow d'annotation d'OBA&OBR. Ce travail est en cours de soumission.
- 2006 : Encadrement d'un étudiant (Frédéric Duvert) en stage M2R Informatique de l'UM2 dont l'objectif était le développement d'une ontologie et de cas d'utilisation du modèle d'intégration agent-Grid AGIL. Ce travail a donné lieu à la publication [12].
- 2005 : Encadrement de 2 groupes de stagiaires d'IUP GMI (Génie Mathématique et Informatique) 2ème année de l'UM2. Le premier concernait le développement d'une application service web pour la programmation par contraintes (co-encadré avec Dr. Remi Coletta). Le deuxième concernait le développement d'une expérimentation du modèle STROBE sous MadKit.

RESUME DES PUBLICATIONS

Une liste complète des publications classées par type est disponible plus loin. L'ordre des auteurs des publications n'est pas alphabétique ; le premier auteur est l'« auteur principal ». Documents téléchargeables : <http://www.stanford.edu/~jonquet/Publications/>

J'ai une expérience de publication variée. Sur 21 publications :

- 7 sont d'audience nationale (5 conférences et 2 mémoires),
- 14 sont d'audience internationale (4 journaux, 1 série, 4 conférences, 5 workshops),

- 15 sont rédigées anglais, dont mon manuscrit de thèse,
- 8 ont été écrites dans un cadre de collaboration (équipe, encadrement d'étudiant ou projet collaboratif)

Les journaux, conférences et workshops dans lesquels j'ai publié m'ont permis de contacter des communautés différentes. Ainsi, mes publications peuvent être classées dans les thèmes suivants :

- **Web sémantique et application biomédicale** : Les articles [1] et [6] sont publiés respectivement dans un des meilleurs journaux (*BMC Bioinformatics*) et une des meilleures conférences d'informatique biomédicale (*AMIA*). Nous attendons de bonnes références pour ces articles étant donné la douzaine de groupes qui collaborent avec nous dans le cadre du projet NCBO et qui utilisent les résultats & outils présentés dans ces articles. L'article [7] est publié dans une conférence moins importante mais de bonne qualité pour la communauté (*DILS*). L'article [15] est équivalent à l'article [6] mais dans une des conférences francophones appropriées (*JFIM*).
- **Intégration agent-grid-service** : L'article [2] est publié dans le journal de référence pour ce sujet (*Multiagent and Grid systems*). Cet article publié tardivement commence à générer de l'intérêt. Les articles [10][11][12] ont été publiés dans des workshops très thématiques ce qui illustrent la spécificité du sujet traité. L'article [16] est l'équivalent à l'article [11] mais dans une des conférences francophones appropriées (*JFSMA*).
- **Système multi-agent et intelligence artificielle** : L'article [4] est publié dans un très bon journal d'IA (*Applied Artificial Intelligence*). Les articles [17][18][19] sont publiés dans des conférences d'IA francophones (respectivement *RFLA*, *JFSMA*, *ALCAA*).
- **Apprentissage collaboratif et communautés virtuelles** : Les articles [3][5][8][13][14] ont été publiés dans un contexte de projet collaboratif (projet EU ELeGI) mais dans des supports de moyenne audience.

RESUME DE L'ACTIVITE D'ENSEIGNEMENT

- **4 ans d'enseignements universitaires variés** (400h~TD d'enseignement effectués) à des publics différents (scientifique et littéraire).
- Préparation des cours/TD/TP, participation à l'évaluation (rédaction des sujets, corrections, jury), encadrement de projet et de stage, responsabilités administratives.
- Enseignements effectués : Introduction à la programmation et à l'algorithmique (Scheme, Maple), Certificat Informatique et Internet (bureautique, plateforme d'enseignement à distance, etc.), Informatique de l'Internet (HTML, Java/Javascript, PHP, etc.)
- Encadrements : stagiaires d'IUP & stage de M2R Informatique (UM2), BSc. Computer Science (Stanford).

RESPONSABILITES COLLECTIVES & AUTRES ACTIVITES

- **Participation au processus de préparation et de soumission de projets européens** (2005 & 2007) dans le cadre du 6^{ème} et 7^{ème} PCRD. Connaissance des programmes de recherche européens (« coopération » & « people »).
- **Représentant élu des doctorants du département Informatique du LIRMM (2004-2005)**. Cette fonction m'a amené à participer à des réunions hebdomadaires (« comité de projet » et/ou conseil) et à y défendre le point de vue des doctorants. Cela m'a permis de bien comprendre l'organisation et les mécanismes de fonctionnement d'un laboratoire de recherche.
- Membre du comité de programme pour Service-Oriented Computing: Agents, Semantics, and Engineering (SOCASE) workshop, 2009.

- Membre du comité de programme pour Extending Database Technology for Life Sciences (EDTILS) workshop, 2009.
- Membre du comité éditorial pour Grid Computing and Multi-Agent Systems journal, 2008. Nouveau journal dirigé par Pr. Maher Khemakhem à paraître en 2009 chez Serials Publications.
- Participation à des relectures d'articles (ITS 2008, ALCAA 2004, etc.).
- Pendant ma thèse, j'étais membre du **Groupe de Travail Modèles Formels de l'Interaction (GT-MFI)**¹ qui regroupe des chercheurs francophones des 3 domaines : systèmes multi-agents, interface homme machine et environnements informatiques pour l'apprentissage humain (<http://mfi.univ-lille1.fr>).

COMPETENCES TECHNIQUES

- Langages de programmation : fonctionnel/applicatif (Lisp, Scheme) ou orienté objet (Java) ou impératif (Maple)
- Services Web SOAP/WSDL (Axis) & REST (RestLet)
- Ontologies & terminologies biomédicales (SNOMEDCT, Mesh, UMLS, OBO)
- Base de données (SQL), bonne expérience avec MySQL/JDBC et les langages de modélisation (UML, BPMN)
- Langages Web (XML, HTML, Javascript, PHP) et Web sémantique (RDF, OWL)
- Connaissance des environnements Unix (Solaris, Linux), Windows et MacOS
- Utilisation avancée de plateformes de travail et télé-formation telles que WebCT
- Plateforme multi-agent MadKit (plateforme développée dans l'équipe Kayou)

LOISIRS ET INTERETS PERSONNELS

- Expériences dans le monde associatif (étudiant, social, patrimoine, sportif)
- Musiques actuelles, locales et traditionnelles
- Voyages (Europe, Amérique du Nord/Sud et Asie du sud-est)
- Escalade en falaise ou en salle et autres sports extérieurs (alpinisme, cascade de glace, randonnée, etc.)
- Lecture : roman et presse

LANGUES

- Anglais bon (écrit et parlé)
- Quelques connaissances en espagnol
- Orientation internationale forte (publications & thèse en anglais, jury de thèse international)

TRAVAUX SAISONNIERS

- 1998 – 2002 : Caviste pendant les vendanges (dans les caves de Sernhac (30), Prades Le Lez (34) et Vendargues (34))
- 1996 – 2002 : Ouvrier agricole à Sernhac (30)
- Divers travaux de maçonnerie

¹ Groupe de travail du GdR I3 (Information-Interaction-Intelligence).

RESEARCH ACTIVITY

Since 6 years, I have had different experiences and a large range of interests from artificial intelligence to biomedical informatics. I briefly describe the context of my different research activities, detail the scientific aspects addressed and summarize my contributions.

MSC RESEARCH ACTIVITY (2003 AND BEFORE)

SUBJECT & CONTRIBUTIONS

We address the following problem: how can an agent change dynamically (i.e., at run time) its behaviour based on messages it receives during a conversation. We showed that **using meta-programming techniques (reflexivity/reification) in an agent architecture** an agent can actually dynamically modify the way it interprets messages and then adapt its behaviour. For instance, in applicative/functional programming languages, reflective programming allows an interpreter to be dynamically (i.e., during the evaluation process) changed in order to access and eventually modify the execution context² of a procedure. Embedded into agents, such a feature enables them to dynamically learn at the *data, control* and *interpreter* levels enabling them to change the way they interpret messages in a conversation. We illustrate the model with an experiment where an agent (as a Scheme interpreter) learn dynamically a new performative.³ This meta-level learning by communicating was envisaged as a great feature to go toward the *dynamic service generation* vision presented hereafter. This work lead to the following publications: [17][18][19][21]. Also, as MSc. student at UM2, I worked with some fellows on different student “research” projects (usually a couple of months long): (i) Warbot (robot agents) contest with the **multi-agent platform MadKit** (advisor Pr. Jacques Ferber), (ii) coordination in **cellular automata** (advisor Dr. Philippe Reitz).

CONTEXT

My MSc research projects (6 months) was done at **Laboratory of Informatics, Robotics, and Microelectronics of Montpellier (LIRMM)**, University Montpellier 2 (UM2), within the Kayou team concerned with topics such as agents and multi-agent systems, constraints, machine learning, Web, Grid, service-oriented computing, ontologies, collaborative learning. I was supervised by Pr. Stefano A. Cerri. Mainly, this project initiated my PhD research project presented after. However, it allowed me to get interested in some interesting tools for the future such as for example applicative/functional programming languages (e.g., Scheme/Lisp).

PHD THESIS RESEARCH ACTIVITY (2003-2006)

SUBJECT

My thesis project was about **dynamic service exchange modelling**. In a computing world where services become more and more important, the project tackled the hard question: how services can be dynamically and interactively constructed and exchanged in order to accurately identify and fit the user problem. The notion of service is now at the centre of distributed system development; it plays a key role in their implementation and success. New needs in service exchange scenarios are clearly highlighted (dynamicity, composition, conversation based, user-centred behaviour, customization, business processes, semantics, etc.) by the service-oriented computing community and are not addressed by current service oriented architectures (e.g., web services). The next generation of services will consist of dynamically generated services, i.e., **services constructed on the fly by the service provider according to the conversation it has with the service user**.

² The set of elements (expression, environment, interpreter, continuation) intervening in the evaluation of an expression. The value of an expression depends on the execution context.

³ In agent communication languages (FIPA ACL, KQML), performatives play the role of speech act for a message.

In the thesis [20] I lead a deep reflection about the notion of service. I explain that providing a service means to identify and offer a solution (among many possible ones) to the problem of another. A service is not just a pre-determined product. I introduce the concept of **dynamic service generation** as a different way to provide and use services in a computer-mediated context: services are dynamically constructed, provided and used by agents (human or artificial) within a community, by means of a conversation. In dynamic service generation, the user agent is not assumed to know exactly what the provider agent can offer him. He has to find out and construct step by step what he wants based on the service provider's reactions. The central idea is that a service is based on a conversation. Actually, dynamic service generation highlights the idea of processing something new instead of merely delivering something that already exists such as in the product approach. In everyday life, when somebody needs new clothes, buying *ready-to-wear clothes* is analogous to asking for a product, whereas *having clothes made by a tailor* is analogous to requiring a service to be generated.

METHODS

To address that big challenge we were interested in grid and multi-agent systems. Grid because this is the first distributed architecture (and infrastructure) really developed in a service-oriented perspective: grid services are compliant web services, based on the dynamic allocation of virtualized resources to an instantiated service. Grid services augment the basic notion of web service with two significant features: service state and service lifetime management. Whereas web services have instances that are stateless and persistent, grid service instances can be either stateful or stateless, and can be either transient or persistent. On the other hand, agents are said to be autonomous, intelligent and interactive entities that may use and provide services (in the sense of particular problem-solving capabilities). Actually, agents have many interesting characteristics for service exchange: they are reactive, efficient, adaptive, they know about themselves, they have a memory and a persistent state, they are able to have conversation, work collaboratively, negotiate, learn and reason to evolve, deal with semantics associated to concepts by processing ontologies, etc. As they are based on a conversation, a key identified aspect to dynamically generate services was the ability for services to have a state (grid) and then being able to intelligently and dynamically modify this state (agent).

CONTRIBUTIONS

I made three precise contributions: (i) **STROBE, a new agent representation and communication model** [4]. STROBE is inspired by the three Scheme primitives STream, Object and Environment. STROBE agents are able to interpret communication messages and execute services in a given dynamic conversation context. These contexts are dedicated to a specific interlocutor (or group of interlocutors). These contexts take the form of several environments (with meta-programming techniques) in which agent capabilities and messages are interpreted. Thanks to those environments an agent has a part of its state that evolves according to the interactions it has with another agent. A STROBE agent develops a dedicated language for each of its interlocutors. This feature was exploited in the perspective of dynamic service generation. In the context of service exchange, this feature allows an agent to dynamically specify and execute a service. We illustrated such a scenario with a train ticket booking service agent. Having dedicated and dynamic conversation context is the key new aspect of the STROBE model. (ii) ***i-dialogue, a computational abstraction that models multi-agents conversations*** by means of fundamental constructs of applicative/functional languages (i.e., streams, lazy evaluation and higher-order functions) [9]. An *intertwined-dialogue* takes the form of a recursive function, producing and consuming streams of messages, run by each agent in a multi-agents (more than two) conversation. (iii) **AGIL, a service-oriented grid-agent integrated model** based on the representation of agent capabilities as grid services [2]. Many works demonstrate the use of multi-agent techniques for grid (e.g., agent based resource management) or merging web/grid services standards with agents ones, but none of them propose a concrete integration of the two paradigms. AGIL is a new, concrete and formalized integration of

the agent and grid paradigms. In this model, concepts of grid and multi-agent systems, relations between them and the rules are semantically described by a set-theory formalization and a common graphical description language, called *Agent-Grid Integration Language (AGIL)* – also formalized as an ontology [12]. AGIL aggregates the thesis results together by formalizing agent interactions for service exchange on the grid. I demonstrate how such integration is a great feature for services. For example, I demonstrate the importance of the concept of state in service exchange (i.e., being able to have a state, being able to dedicate a part of this state to an interlocutor and being able to intelligently and dynamically modify this state). I highlight how stateful and dynamic grid services (by opposition to stateless web services) and agent dedicated conversation context are two complementary approaches to deal with dynamic generated services. This integration model was also inscribed in the perspective of dynamic service generation. My thesis work lead to the following set of publications: [2][4][9][10][11][12][15].

CONTEXT & DEFENCE JURY

My thesis research project (3 years) was also done at LIRMM supervised by Pr. Stefano A. Cerri. I had a French government MENRT grant. I wrote and defended (November 16, 2006) my thesis in English.

Michael N. Huhns,	Pr., University of South Carolina, USA	(rapporteur)
Luc Moreau,	Pr., University of Southampton, UK	(rapporteur)
Domenico Talia,	Pr., Università della Calabria, Italy	(rapporteur)
Amal El Fallah Seghrouchni	Pr., Université Paris 6, France	(examinateur)
Jacques Ferber,	Pr., Université Montpellier II, France	(examinateur)
Jean-Luc Koning,	Pr., Inst. Nat. Polytechnique de Grenoble, France	(examinateur)
Stefano A. Cerri,	Pr., Université Montpellier II, France	(directeur)

FRENCH SUMMARY

L'objet de cette thèse est la modélisation de l'échange dynamique de services. La notion de service joue désormais un rôle clé dans le développement, la diffusion et l'implémentation des systèmes distribués. Cette thèse propose **une réflexion sur la notion de service et introduit le concept de Génération Dynamique de Service (GDS)** comme une approche différente de l'échange de service en informatique, dans laquelle des services sont dynamiquement construits, fournis et utilisés par des agents (humains ou artificiels). Ces échanges de services sont basés sur des conversations qui ont lieu au sein de différentes communautés. Deux caractéristiques de la GDS sont particulièrement mises en avant : l'aspect orienté **agent** et l'aspect orienté **Grid**. La thèse se situe donc à l'intersection de trois domaines : le Service-Oriented Computing (SOC), les Systèmes Multi-Agents (SMA) et GRID. Les trois contributions majeures sont : (i) la proposition d'un **nouveau modèle de représentation et de communication agent, appelé STROBE**, qui permet aux agents de développer dynamiquement un langage différent pour chacun de leurs interlocuteurs. Ils sont capables d'interpréter des messages et d'exécuter des services dans des contextes de conversation dédiés; (ii) **une fonction, appelée i-dialogue, qui modélise les conversations agents** à l'aide des principes de la programmation applicative/fonctionnelle (i.e., flots, évaluation paresseuse, procédures de première classe) ; (iii) **un modèle d'intégration GRID-SMA** qui représente les capacités des agents par des services Grid. Dans ce modèle, un langage formel, **appelé Agent-Grid Integration Language (AGIL)**, décrit sémantiquement et graphiquement les concepts clés de GRID et SMA, leurs relations, ainsi que les règles de leur intégration. AGIL intègre tous les résultats de la thèse en proposant une formalisation des interactions entre agents pour l'échange de services sur le Grid.

RESEARCH PROJECTS 2003-2007

LEARNING GRID OF EXCELLENCE WORKING GROUP (LEGE-WG)

The project (IST STREP Project EU – FP6) aimed to facilitate the establishment of a “European Learning Grid Infrastructure” by supporting the systematic exchange of information and by creating opportunities for close collaboration between the different

actors in the formative process. The project gave birth to the ELeGI project. My contribution within LeGE-WG took the form of collaboration with Pr. Marc Eisenstadt (Knowledge Media Institute, Open University, UK) and his group to propose a common vision based on learning agents (artificial) and enhanced presence (human) for dynamic services. This led to the following publication: [5][14].

EUROPEAN LEARNING GRID INFRASTRUCTURE (ELEGI)

The goal of the ELeGI project (www.elegi.org, IST Integrated Project EU – FP6) was to promote a shift from the traditional e-learning approach (content-centred) to an interaction based, collaborative and experimental one. This new paradigm focused on knowledge construction using experimental based and collaborative learning approaches in a contextualized, personalized and ubiquitous way to replace the current information transfer paradigm focused on content and on the key authoritative figure of the teacher who provides information. The project aimed to propose a grid service-oriented architecture to support this paradigm shift. Important members of ELeGI consortium were UM2, Open University, Universities of Southampton, Dundee, Pau, St Andrews, ATOS origin.

Within the context of the ELeGI project I worked on a **collaborative environment constructed over a grid infrastructure called the Grid Shared Desktop (GSD)**. The GSD is Web-accessible environment that provides members of a virtual community with a set of desktops supporting collaboration in both synchronous and asynchronous mode. It is a powerful interface relying on grid service architecture to communicate user representations and build collaborative knowledge. As a new aspect in collaborative learning, we demonstrated that grid features (stateful and dynamic services, virtual community management) are adapted for collaboration questions that involve people, resources, and services all together to solve a common problem. We evaluated the GSD with a community of chemists tackling the problem of **collaborative construction of an ontology** (using the ontology editor Protégé within the GSD). This work was done in collaboration with Dr. Monica Crubezy (Stanford Medical Informatics, Stanford University, USA), Dr. Claude Laurencu (Institut Charles Gerhardt de Montpellier, UMR, France) and Pr. Alain Krief (Laboratoire de Chimie Organique Synthèse, Faculté N.-D de la Paix, Belgium) and led to the following publications: [3][8].

NATIONAL CENTER FOR BIOMEDICAL ONTOLOGY (NCBO)

NCBO (part of NIH Roadmap NCBCs⁴) is a consortium of leading biologists, clinicians, informaticians, and ontologists who develop innovative technology and services that allow scientists to create, disseminate, and manage biomedical information and knowledge in machine-processable form. The project vision is that all biomedical knowledge and data are disseminated on the Internet using principled ontologies, such that the knowledge and data are semantically interoperable and useful for furthering biomedical science and clinical care. Important members of NCBO consortium are Stanford University, Mayo Clinic, and University of Victoria. My contributions within NCBO are detailed hereafter.

POSTDOCTORAL RESEARCH ACTIVITY

As postdoctoral fellow I am a member of the **Stanford Center for Biomedical Informatics Research (BMIR)** within Pr. Mark A. Musen's group. BMIR concentrates on the study of components for building knowledge-based systems, controlled terminologies and ontologies, and technology for the Semantic Web. For 20 years, this laboratory proposed contributions to assist tasks in biomedicine. **BMIR still develops the Protégé ontology editor & API, which is the most widely used, ontology editor today.**

Within NCBO we develop a **Web repository of biomedical ontologies**, called BioPortal. This library contains a large collection of ontologies in biomedicine in different format (OBO, OWL etc.) such as Gene Ontology, NCI Thesaurus, ICD, FMA. Users can

⁴ National Centers for Biomedical Computing, www.ncbcs.org/

browse, search, and comment (social Web) ontologies both online and via a Web services API. The goal of NCBO is to provide the biomedical community with a set of ontology-based services that can be used by scientists to integrate their data and enhance translational discoveries (biomedical data integration problem). In that context I lead conjunctly with Dr. Nigam H. Shah (PhD, MD) the semantic annotation of biomedical data activity of the center. NCBO encourage biomedical researchers to annotate their data with biomedical ontology concepts for better data integration, search and discoveries. As main activity, **I design, implement and experiment an ontology-based annotation workflow to annotate text data with ontology concepts.** The workflow is based on syntactic concept recognition (using concept names and synonyms) and on a set of semantic expansion algorithms that leverage the semantics in ontologies (e.g., is_a relations, mappings, semantic distance) to create new annotations. The annotation workflow uses one of the largest available set of biomedical ontologies (from UMLS⁵ and NCBO BioPortal) and generates annotations in several formats like XML and RDF/OWL. **We provide the workflow as a web service: the Open Biomedical Annotator (OBA)** [6][15]. The biomedical community can use the annotator service to tag datasets automatically with ontology terms. After 8 months of existence OBA counts already 8 academic groups (Univ. of California, San Francisco, Univ. of Indiana, Jackson Lab) that use and experiment the service in specific scenarios. Internally, we have used the annotation workflow to index biomedical data resources with ontology concepts [1][7]. The **Open Biomedical Resources (OBR) annotation index** allows a user to search for biomedical data based on ontology concepts. The OBR index is directly queryable in the NCBO BioPortal ontology repository: when a user browses a given concept, he has access (link) to the list of resource elements that have been annotated with this concept. We have processed the textual metadata of elements from 5 biomedical resources (e.g., abstract of articles (Pubmed), gene expression data sets (Array Express), clinical-trial reports (Clinical Trials.gov)) and new ones are still incorporated.

Developing the annotation workflow allows me to be interested in several aspects related to ontologies and semantic web: (i) development and reuse of semantic distances (graph/path based or information content based), (ii) development and management of ontology mappings, (iii) graph algorithms (e.g., traverse, paths between concepts) to deal with the is_a hierarchy structure, (iv) ontology and concepts URI to deal with ontology versioning and annotations maintenance. Details about the technical contributions are provided later.

SOFTWARE DEVELOPMENT & TECHNOLOGY TRANSFER

The development project done in the context of my PhD had a proof-of-concept objective. My main experience in terms of application, software & services development was as a postdoc. Within NCBO, I am involved in both the research and development activities. Being involved in all the stages of a development project from research to prototype and to production is a very good learning experience of software engineer practices (project management, code sharing, developer meetings & conferences, technical questions, budget). Furthermore, the NCBO project is driven by several “driving biological projects” (DBP). Being driven by those projects is a very interesting in terms of research, design and software development. It provides direct feedback and evaluation that are instantly re-injected in the design loop.

⁵ Unified Medical Language System (UMLS) www.nlm.nih.gov/research/umls/

STROBE MODEL IMPLEMENTATION

Description	<p>www.stanford.edu/~jonquet/Recherche/LIRMM/STROBE/</p> <p>The STROBE implementation project was done to demonstrate with some experiments some important features of the STROBE model. The two main experiments illustrate: (i) meta-level learning by communicating, where STROBE agents modify their interpreters while communicating and learn a new communicative acts by; ii) dynamic specification where STROBE agents specify by interactions a function that must be executed to accomplish a service (using non deterministic interpretation & constraints) [4].</p>
Contribution	<p>I was the main contributor. I also supervised a group of BSc. Students working on the subject.</p> <p>A first partial implementation was done in Scheme (to implement the core of agent interpreters using reflective programming techniques). A second one, StrobeKit, was done in Scheme/Java within the multi-agents platform MadKit (www.madkit.org) and the Kawa framework (www.gnu.org/software/kawa) to connect Scheme and Java. The StrobeKit API enables a programmer to write agents that respect STROBE model's requirements concerning agent structure and agent interaction.</p> <p>More detail on the STROBE model implementation is available Appendix C of my PhD thesis [20].</p>
Difficulty	<p>I suggested in this project to embed in an agent architecture a “reflexive tower” such as the one available in functional/applicative languages (e.g., Scheme/LISP). Using reflective programming techniques to dynamically change the way an expression is evaluated is not an easy task. Doing it for agent architecture was new.</p> <p>There was a technological challenge in developing Java agents (within MadKit) while keeping the meta-level learning feature of the STROBE model. An interpreted language such as Scheme allows to easily describe meta-evaluators which may help. The Kawa framework was used to embed Scheme constructs in Java agents.</p> <p>Technologies: Java, Scheme, Kawa, MadKit.</p>
Impact	<p>The project stayed as a prototype. It was validated by some experiments. These experiments are not real world applications, but they are significant as they represent solutions for large classes of problems. They demonstrate that our approach is viable.</p>
Dissemination	<p>The STROBE model is the subject of the following publications: [4][5][13][14][17][18][19][20][21].</p>

OPEN BIOMEDICAL ANNOTATOR & RESOURCES PROJECT

Description	<p>http://obs.bioontology.org/</p> <p>This project is divided into two products:</p> <ul style="list-style-type: none"> • The Open Biomedical Annotator (OBA) is a web service that allows a user to annotate biomedical text data with biomedical ontologies from the NCBO BioPortal & UMLS repositories. OBA implements the workflow previously mentioned. The web service can be parameterized to the user needs (ontologies to use, semantic expansion) and the annotations are returned in several formats (text, tab-delimited, XML).
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	<p>and OWL). The OBA web service is deployed as a SOAP and REST web service.</p> <ul style="list-style-type: none"> • The Open Biomedical Resources (OBR) annotation index is a database of annotations of biomedical data created with the OBA workflow. Within OBR several biomedical resources are indexed by ontology concepts allowing ontology-based search of these data as well as cross integration. The OBR index is queryable by a REST web services interface. OBR results are directly integrated in the BioPortal web application in the “Resources” tab. <p>These 2 NCBO products are the major activities of the center core 2 (leveraging biomedical data with ontologies). They have been developed for 15 months. Each product has been implemented, deployed, tested and evaluated with two generation of prototypes. The production version is now under development and planned for early 2009. The project is developed in the biomedical context, however, the methodology and design is domain independent.</p>
Contribution	<p>We are leading the development of this project conjunctly with Dr. Nigam Shah. As a biomedical scientist Dr. Shah supervises the biomedical aspects of the projects (biomedical resources to process, scenario to follow, use cases to address). I supervise the computer science aspects (general design and specification, architectural decision, semantic web techniques, etc.).</p> <p>For the first 12 months of existence of the project I was the only developer involved (50% of my time). I have designed and implemented the 2 generations of prototypes. They can be accessed and tested here: http://obs.bioontology.org/. The code is maintained on a SVN repository (http://bmir-gforge.stanford.edu). Since the last 3 months, I collaborate with another postdoc on OBR and I supervise (design, specify) a software engineer for the production development of OBA&OBR.</p>
Difficulty	<p>The main motivation is that ontology-based annotation helps to maintain the huge quantity of biomedical data searchable and processable in order to help users to find the information they are interested in. This is an important topic in the community. The originalities of our approach are:</p> <ul style="list-style-type: none"> • The OBA is an automatic web service that can be integrated in current workflow and used by software agents; • OBA&OBR really leverage the knowledge embedded in ontologies to create new annotations (syntactic recognition and semantic expansion). Especially, the use of is_a relations, mappings and semantic distance to create new annotations has showed very useful. • OBA&OBR used a specific service model ontology and returns annotations as an OWL ontology populated with annotations as instances following the semantic web standards; • OBA&OBR has access to a very large number of ontologies (almost all existing biomedical ontologies). The project try to address the real issue of semantic annotations of biomedical data on a large scale, for various resources and multiple ontologies in order to provide users with a service they can concretely use. As a consequence, scalability issues are very important (e.g., the workflow actually deals with more than 3M of concepts and 7M terms). <p>Developing and maintaining an annotation workflow and an annotation index is</p>

	<p>not trivial because of versioning and updating. Indeed, both biomedical resources and biomedical ontologies are changing every day. For example, for the OBR index, an incremental approach needs to be taken to annotate everything with the new delta each time ontologies are updated. In the same way, new added resource elements need to be annotated with the most recent version of the ontologies. In our prototypes we have addressed these questions.</p> <p>Another difficult aspect of the project is the preprocessing that is necessary to make the workflow concretely usable. We have to pre-compute the data necessary for the annotation workflow. We make the new information created available as independent services. These services provided the information necessary for the semantic expansion step achieved in the annotation workflow. I have written several algorithms to traverse the ontology graphs (is_a transitive closure, semantic distance) and pre-compute the necessary information.</p> <p>Technologies: Java, XML, MySQL & JDBC, Web services (SOAP/WSDL), REST services (RestLet), OWL/RDF.</p>
Impact	<p>The semantic annotation part of the NCBO project is now a key element for the 3 driving biological projects of NCBO and other collaborations with the center (www.bioontology.org/collaboration.html). In the context of these collaborations, new resources will be added to the OBR index in the following months and new applications and uses of OBR&OBA are evaluated.</p> <p>After 8 months of existence, OBA is currently being evaluated for use in several external projects, for example: (1) Researchers working on Trialbank (www.trialbank.org) at the University of California, San Francisco, create annotations for HIV/AIDS clinical trials in order to provide a web application for visualizing, and comparing the trials. They are evaluating the use of OBA to process the 'health condition', 'intervention' and 'outcomes' fields for trial records from clinicaltrials.gov. (2) Researchers at the University of Indiana are evaluating the utility of embedding the service in their research management system called Laboratree (http://laboratree.org); so that any textual annotation created in Laboratree would also have corresponding ontology term annotations.(3) Developers at Collabrx (http://collabrx.com) are embedding the service in their Rex platform for processing user generated content; and will evaluate the suitability of using medical dictionaries for processing such content. (4) Researchers at the Jackson Lab (www.jax.org) are evaluating the utility of the OBA service in triaging articles for curation based on the ontology terms recognized in their title and abstract. Each of these groups get better interoperability of their data by using ontology annotations created with the OBA. We are currently working on specific evaluations of OBA when used by each of these groups.</p> <p>The most advanced user group of the OBA web service is the Center for Clinical and Translational Informatics (http://ccti.ucsf.edu/) at the University of California, San Francisco. Pr. Ida Sim (ida.sim@ucsf.edu) may confirm the utility of the NCBO services for her group.</p>
Dissemination	<p>The Open Biomedical Annotator/Resources project is the subject of the following publications: [1][6][7][15][22][23]. Several posters [29][30] has been also presented in meetings and conferences as well as demonstrations, keynote presentations and tutorials (done by Dr. Nigam Shah) especially at: International Conference Intelligent Systems for Molecular Biology (ISMB 2008), American Medical Informatics Association Annual Symposium (AMIA 2008), Pacific Symposium on Biocomputing (PSB 2009), Conference on Semantics in Healthcare and Life Sciences (C-SHALS 2009).</p>

Description	<p>http://bioportal.bioontology.org/</p> <p>NCBO develops a Web application called BioPortal to access biomedical ontologies. Users can browse, search, comment and annotate the library of ontologies both online and via a web services API. At the period of writing, BioPortal contains more than 110 ontologies and 600 000 concepts. A user group of approximately 25 persons provides regular feedbacks from the biomedical community.</p>
Contribution	<p>I contribute to BioPortal mainly in the context of the OBA&OBR project presented hereafter and for the REST services the application is based on. I also play an important role for manual and automatic quality insurance of the application.</p> <p>The new release of BioPortal (2.0 – August 2008) allows users to search biomedical data using the annotations created in the context of the OBR project presented before. When browsing a concept in BioPortal, one can access, via the “Resource” tab, the resource elements that have been annotated in the OBR index. This new feature uses the web service API I have designed to access the OBR annotations index.</p>
Impact	<p>BioPortal plays a major role for the biomedical community. It complements the National Library of Medicine UMLS project specialised on biomedical vocabularies/terminologies. NCBO BioPortal is now established has the standard place to access biomedical ontologies. It is commonly used by some of the major biomedical informatics project like caBIG, the GO project, National Cancer Institute, etc.</p> <p>The new features that my work has enabled are the first set of services in BioPortal not dedicated to the ontologies themselves but rather dedicated to what can be done with these ontologies. How to use them in concrete data applications.</p>

SEMINARS & PRESENTATIONS

- 8 presentations in conferences.
- Seminar of the Kayou team at LIRMM, UM2, France, February 2009 (invited by Pr. Stefano A. Cerri).
- Seminar of the EDELWEISS team at INRIA Sophia-Antipolis, France, January 2009 (invited by Dr. Fabien Gandon et Dr. Olivier Corby).
- Talk at the NCBO Developer Conference, Stanford University, USA, December 2007.
- Seminar of the Intelligent Interactive Distributed Systems group, Vrije Universiteit, Amsterdam (invited by Pr. Frances Brazier). May 2007.
- LIRMM's Informatics department day, UM2, France. July 2005.
- Seminar of the Protégé group, Stanford Medical Informatics, Stanford University, CA, USA (invited by Dr. Monica Crubezy). June 2005.
- E-LeGI WP6 (Work Package 6) seminar, LIRMM, UM2, France. June 2004.
- Computer Science PhD students seminar, LIRMM, UM2, France. January 2004.
- Talk within the GT MFI (Groupe de Travail Modèles Formels de l'Interaction) working group, LIP6, Université Paris 6, France. December 2003.
- Social Informatics seminar, LIRMM, UM2, France. June 2003.

PUBLICATIONS

JOURNAL

- [1] Nigam H. Shah, Clement Jonquet, Annie P. Chiang, Atul J. Butte, Rong Chen, Mark A. Musen, **Ontology-driven Indexing of Public Datasets for Translational Bioinformatics**, *BMC Bioinformatics*, Vol. 10, February 2009.
- [2] Clement Jonquet, Pascal Dugenie, Stefano A. Cerri, **Agent Grid Integration Language**, *Multiagent and Grid Systems*, Vol. 4 (2), pp. 167-211, 2008.
- [3] Pascal Dugénie, Philippe Lemoisson, Clement Jonquet, Monica Crubézy, Claude Laurengo, **The Grid Shared Desktop: A Bootstrapping Environment for Collaboration**, *Advanced Technology for Learning, Special issue on Collaborative Learning*, Vol. 3 (4), pp. 241-249, 2006.
- [4] Clement Jonquet, Stefano A. Cerri, **The STROBE model: Dynamic Service Generation on the Grid**, *Applied Artificial Intelligence Journal Special issue on Learning Grid Services*, Vol. 19 (9-10), p.967-1013, November 2005.

(à venir)

- Nipun Bhatia, Nigam H. Shah, Clement Jonquet, Daniel L. Rubin, Annie P. Chiang, Mark A. Musen, **Comparing Concept Recognizers for Ontology-Based Indexing: MGREP vs. MetaMap**. Extended version of *AMLA Summit on Translational Bioinformatics* accepted for publication in *BMC Bioinformatics*.
- Clement Jonquet, Pascal Dugenie, Stefano A. Cerri, **Service-Based Integration of Grid and Multi-Agent Systems Models**, Extended version of [11] accepted for publication in inaugural issue of *International Journal of Grid Computing and Multi Agent Systems (GCMAS)*.

SERIE

- [5] Clement Jonquet and Marc Eisenstadt and Stefano A. Cerri, **Learning Agents and Enhanced Presence for Generation of Services on the Grid**, In P. Ritrovato and C. Allison and S.A. Cerri and T. Dimitrakos and M. Gaeta and S. Salerno (eds): *Towards the Learning GRID: Advances in Human Learning Services*, Vol. 127, Frontiers in Artificial Intelligence and Applications, p.203-213, IOS Press, November 2005.

INTERNATIONAL CONFERENCE

- [6] Clement Jonquet, Nigam H. Shah, Mark A. Musen, **The Open Biomedical Annotator**, *AMLA Summit on Translational Bioinformatics*, p.56-60, March 2009, San Francisco, CA, USA.
- [7] Clement Jonquet, Mark A. Musen and Nigam H. Shah, **A System for Ontology-Based Annotation of Biomedical Data**, In A. Bairoch, S. Cohen-Boulakia and C. Froidevaux (eds): *International Workshop on Data Integration in The Life Sciences 2008, DILS'08*, Vol. 5109, Lecture Notes in Bioinformatics, p.144-152, Springer-Verlag, June 2008, Evry, France.
- [8] Stefano A. Cerri, Monica Crubézy, Pascal Dugénie, Clement Jonquet, Phillippe Lemoisson, **The Grid Shared Desktop for CSCL**. P. Cunningham and M. Cunningham (eds), *Exploiting the Knowledge Economy: Issues, Applications, Case Studies*, Vol. 3, Information and Communication Technologies and the Knowledge Economy, p. 1493-1499, IOS Press, Amsterdam, Netherlands, 2006. Proceedings of eChallenges 2006 Conference, October 2006, Barcelona, Spain.
- [9] Clement Jonquet, Stefano A. Cerri, **I-Dialogue: Modelling Agent Conversation by Streams and Lazy Evaluation**, *International Lisp Conference, ILC'05*, Stanford University, CA, USA, June 2005.

- [10] Pascal Dugenie, Clement Jonquet, Stefano A. Cerri, **The Principle of Immanence in GRID-Multiagent Integrated System**, R. Meersman, Z. Tari, P. Herrero (eds.) *4th International Workshop On Agents and Web Services Merging in Distributed Environments, AWeSOMe'08*, , OTM 2008 Workshops, Vol. 5333, Lecture Notes in Computer Science, pp. 98-107, Springer-Verlag, Monterrey, Mexico, November 2008.
- [11] Clement Jonquet, Pascal Dugenie, Stefano A. Cerri, **Service-Based Integration of Grid and Multi-Agent Systems Models**, *International Workshop on Service-Oriented Computing: Agents, Semantics, and Engineering, SOCASE'08*, Vol. 5006, Lecture Notes in Computer Science, pp. 56-68, Springer-Verlag, Estoril, Portugal, May 2008.
- [12] Frédéric Duvert, Clement Jonquet, Pascal Dugénie, Stefano A. Cerri, **Agent-Grid Integration Ontology**, R. Meersman, Z. Tari, P. Herrero(eds.) *International Workshop on Agents, Web Services and Ontologies Merging, AWeSOMe'06*, Vol. 4277, Lecture Notes in Computer Science, pp. 136-146, Springer-Verlag, Montpellier, France, November 2006.
- [13] Clement Jonquet, Stefano A. Cerri, **Agents Communicating for Dynamic Service Generation**, *1st International Workshop on GRID Learning Services, GLS'04*, p. 39-53, Maceió, Brazil, September 2004.
- [14] Stefano A. Cerri, Marc Eisenstadt, Clement Jonquet, **Dynamic Learning Agents and Enhanced Presence on the Grid**, *3rd International LeGE-WG Workshop: GRID Infrastructure to Support Future Technology Enhanced Learning*, Berlin, Germany, December 2003, Electronic Workshops in Computing (eWiC).

NATIONAL (FRENCH) CONFERENCE

- [15] Clement Jonquet, Nigam H. Shah, Mark A. Musen, **Un service Web pour l'annotation sémantique de données biomédicales avec des ontologies**, *13èmes Journées Francophones d'Informatique Médicale, JFIM'09*, Nice, France, Avril 2009.
- [16] Clement Jonquet, Pascal Dugenie, Stefano A. Cerri, **Intégration orientée service des modèles Grid et multi-agents**, V. Cherrier and M-P. Huget (eds.), *14èmes Journées Francophones sur les Systèmes Multi-Agents, JFSMA'06*, p. 271-274, Annecy, France, October 2006, Hermès.
- [17] Clement Jonquet, Stefano A. Cerri, **Les Agents comme des interpréteurs Scheme : Spécification dynamique par la communication**, *14ème Congrès Francophone AFRIF-AFLA de Reconnaissance des Formes et Intelligence Artificielle, RFLA'04*, Vol. 2, pp. 779-788, Toulouse, France, January 2004.
- [18] Clement Jonquet, Stefano A. Cerri, **Apprentissage issu de la communication pour des agents cognitifs**, J-P. Briot, K. Gbédira (eds.) *Déploiement des systèmes multi-agents, vers un passage à l'échelle, 11ème Journées Francophones sur les Systèmes Multi-Agents, JFSMA'03*, p. 83-87, Hammamet, Tunisie, November 2003, Hermès.
- [19] Clement Jonquet, Stefano A. Cerri, **Cognitive Agents Learning by Communicating**, P. Anorté (ed.), *7ème Colloque Agents Logiciels, Coopération, Apprentissage & Activité humaine, ALCAA'03*, Bayonne, France, September 2003.

DISSERTATION

- [20] Clement Jonquet, **Dynamic Service Generation: Agent interactions for service exchange on the Grid**, *Phd thesis, Université Montpellier 2*, Montpellier, France, November 2006.
- [21] Clement Jonquet, **Communication Agent et Interprétation Scheme pour l'apprentissage au méta-niveau**, *MSc thesis, Université Montpellier 2*, Montpellier, France, June 2003.

- [22] Clement Jonquet, Mark A. Musen, Nigam H. Shah, **Help will be provided for this task: Ontology-Based Annotator Web Service**, Research Report BMIR-2008-1317, BMIR, Stanford University, USA, May 2008.
- [23] Nigam H. Shah, Clement Jonquet, Mark A. Musen, **Ontrez project report**, Research Report BMIR-2007-1289, BMIR, Stanford University, USA, November 2007.
- [24] Clement Jonquet, Pascal Dugenie, Stefano A. Cerri, **Intégration orientée service des modèles Grid et multi-agents**, *Rapport de Recherche, RR06036*, LIRMM, CNRS & Université Montpellier 2, Montpellier, France, June 2006.
- [25] Clement Jonquet, Pascal Dugenie, Stefano A. Cerri, **Service based integration of Grid and Multi-Agent Systems models**, *Research report, RR06012*, LIRMM, CNRS & Université Montpellier 2, Montpellier, France, February 2006.
- [26] Clement Jonquet, Stefano A. Cerri, **Characterization of the Dynamic Service Generation Concept**, *Research report,, RR06007*, LIRMM, CNRS & Université Montpellier 2, Montpellier, France, February 2006.
- [27] Clement Jonquet, **A framework and ontology for Semantic Grid Services: An integrated view of WSMF and WSRF**, *Unpublished draft research report*, LIRMM, CNRS & Université Montpellier 2, Montpellier, France and KMi, Open University, Milton Keynes, UK, May 2005.

POSTER & DEMONSTRATION

- [28] Mark A. Musen, Nigam H. Shah, Natasha F. Noy, Benjamin Dai, Michael Dorf, Nicholas B. Griffith, James Buntrock, Clement Jonquet, Michael Montegut, Daniel L. Rubin, **BioPortal: Ontologies and Data Resources with the Click of a Mouse**, AMIA 2008 Annual Symposium, Demonstrations, p.1223-1224, Washington DC, USA, November 2008
- [29] Natasha F. Noy, Nigam H. Shah, Benjamin Dai, Michael Dorf, Nicholas B. Griffith, Clement Jonquet, Michael Montegut, Daniel L. Rubin, Cherie H. Youn, Mark A. Musen, **BioPortal: A Web Repository for Biomedical Ontologies and Data Resources**, Poster & Demonstration Session at the 7th International Semantic Web Conference, ISWC'08, Karlsruhe, Germany, November 2008
- [30] Clement Jonquet, Nigam H. Shah, Mark A. Musen, **Using Biomedical Ontologies for Annotations of Biomedical Data**, *National Centers for Biomedical Computing All Hands Meeting*, August 2008.
- [31] Mark A. Musen, Daniel L. Rubin, Nigam H. Shah, Clement Jonquet, Benjamin Dai, Michael Montegut, Ida Sim, Christopher G. Chute, Margaret-Anne Storey, Barry Smith, **The National Center for Biomedical Ontology**, *National Centers for Biomedical Computing All Hands Meeting*, August 2008.

ACTIVITE D'ENSEIGNEMENT

PERSPECTIVE

L'activité d'enseignement que j'ai réalisée en tant que moniteur et ATER m'a particulièrement intéressée. Elle m'a permis de voir les bons et les mauvais côtés de l'enseignement universitaire. Enseigner dans ce cadre, ainsi que le faire évoluer et perdurer, me plaît beaucoup.

La perspective d'encadrement de projets/stages étudiant ou d'activité de recherche (master/doctorat) m'intéresse également beaucoup. Ce sont pour moi des situations particulières et personnalisées de collaboration et d'apprentissage que je trouve très enrichissantes. Cela s'inscrit pour moi également dans une perspective plus longue de carrière (HDR).

EXPERIENCE

- 2003-2006 : **Moniteur CIES à l'Université Montpellier 2**. Le monitorat est ma première expérience d'enseignement. En 3 ans (64h~TD/an), elle m'a permis d'exercer à petite échelle beaucoup des tâches de l'enseignant : préparation des cours/TD/TP, participation à l'évaluation (rédaction des sujets, corrections, jury), encadrement de projet et de stage, tâches administratives etc. Le monitorat m'a aussi permis de suivre un ensemble de formations (expression, théâtre, préparation, projets, etc.) proposées par le Centre d'Initiation à l'Enseignement Supérieur (CIES) de Montpellier.
- 2006-2007 : **ATER (complet) à l'Université Montpellier 3**. Mon expérience d'enseignement (192h~TD) dans une université différente (arts, lettres, langues, sciences humaines et sociales) est également très enrichissante. Elle m'a permis d'intégrer une autre équipe d'enseignement et elle me permet d'avoir affaire à un autre public que celui de l'Université Montpellier 2 (sciences et techniques). J'y exerçais également des responsabilités communes et administratives.

RECAPITULATIF

	Enseignement	Type	Nombre d'heures
Moniteur CIES Univ. Montpellier 2 (2003-2006)	Programmation/Scheme/ évaluation	TD	100h
		TP	60h (40~TD)
	Programmation/Algorith- mique/Maple	TD	24h
		TP	30h (20~TD)
	Divers cours	CM	6h (9~TD)
Encadrement	-	15h~TD	
ATER Univ. Montpellier 3 (2006-2007)	C2i niveau débutant	CM/TD/TP	102h
	C2i niveau avancé	CM/TD/TP	60h
	Internet/Php/Javascript	CM/TD/TP	30h
	TOTAL :		400h (~TD)

■ 2003&2004 : Module « **Introduction à la programmation avec Scheme** »

Public : 2^{ème} année Deug MIAS (Mathématique, Informatique et Applications aux Sciences)

Nombre d'heures : 100hTD & 60hTP.

Objectifs : Ce module vise à introduire aux étudiants les concepts de base de l'abstraction procédurale, l'abstraction de données et des mécanismes d'évaluation (substitution, environnement, etc.) à l'aide d'un langage de programmation fonctionnel/applicatif, Scheme.

Contribution : Pour ce module, j'ai réalisé conjointement avec un collègue moniteur un ensemble de 8 nouvelles feuilles de TD et 6 nouvelles feuilles de TP (pièces jointes **Error! Reference source not found.**et **Error! Reference source not found.**) ainsi que des encadrements de projets. Je me suis également occupé de l'organisation générale du module (équipe, réunions, réservation des salles, etc.).

Responsable : Stefano A. Cerri – cerri@lirmm.fr

URL : <http://www.lirmm.fr/~jonquet/Enseignement/MIAS/>

■ 2005 : Module « **Introduction à l'algorithmique et à la programmation (Maple)** »

Public : 1^{ère} année Licence (sciences)

Nombre d'heures : 24hTD & 30hTP.

Objectifs : Ce module vise à introduire aux étudiants les concepts de base de la programmation (variable, affectation, structure de contrôle, etc.) à l'aide d'un langage algorithmique puis d'un langage de programmation impérative, Maple.

Contribution : Module pour lequel j'ai intégré une équipe d'enseignement importante, ce qui m'a fait découvrir d'autres aspects de l'enseignement. Les feuilles de TD/TP existaient déjà.

Responsable : Philippe Janssen – janssen@lirmm.fr

URL : <http://ens.math.univ-montp2.fr/SPIP/ULIN101>

■ 2006 : « **Certificat Informatique et Internet** » (C2i niveau débutant et avancé)

Public : tous niveaux/toutes filières (lettres & sciences sociales)

Nombre d'heures : 160h~TD (cours/TD/TP mélangés).

Objectifs : Le C2i est un certificat national qui atteste de la compétence et de la maîtrise des technologies de l'information et de la communication. L'enseignement effectué n'est pas de l'Informatique « pure », mais de l'initiation à l'outil Informatique, à la bureautique et à Internet (forum, mails, HTML, etc.). Cela m'a permis de me confronter à des aspects plus pédagogiques que techniques de l'enseignement. Le public ayant très peu l'habitude des ordinateurs.

Contribution : Participation à l'amélioration d'un cours déjà existant. Contributions administratives et techniques.

Responsable : Patrice Séebold – seebold@lirmm.fr

URL : <http://www.univ-montp3.fr/miap/ens/info/index.html>

■ 2007 : Module « **Informatique de l'Internet** »

Public : 2^{ème} année, Licence MASS (Mathématiques Appliquées aux Sciences Sociales)

Nombre d'heures : 30h de TD/TP.

Objectifs : Module dont l'objectif est d'introduire aux étudiants les langages et les concepts de l'Internet (HTML, Java/Javascript, PHP, etc.).

Contribution : Mise à jour et reprise d'éléments de cours existants.

Responsable : Joël Quinqueton – jq@lirmm.fr

URL : <http://www.univ-montp3.fr/miap/ens/MASS/XLIN401/index.htm>

INTERVENTIONS DIVERSES

2004 : Cours en DEA Informatique de l'UM2 dans le module « Système Multi-Agents ».

2006 : Cours en M2P Informatique de l'UM2 dans le module « Informatique Sociale ».