

# Curriculum Vitae

Rahmatullah Hafiz

[rahm.hafiz@gmail.com](mailto:rahm.hafiz@gmail.com)

Home: (514) 935-2127

Cell: (438) 825-2997

cs.uwindsor.ca/~hafiz

---

**CITIZENSHIP** Canadian

## WORK EXPERIENCE

**Researcher and Developer at the NorthSide Inc., Montreal, QC.** (January 2012 to present)

I am responsible for R&D tasks in the area of Natural Language Processing that involves automated knowledge acquisition and its use in real-time reasoning. I am in charge of a project that computes world knowledge from very large-scale text sources to form fact base. This fact base represents relevant syntactic and semantic categories in a way that can be used for intelligent question answering and dialog systems.

**Sessional Instructor at the University of Windsor** (Summer 2010, Fall 2010)

**Object Oriented Analysis and Design (60-322)**

I was responsible for conducting two weekly classes during the summer and fall 2010 for higher year Computer Science students to help them learn well-documented and tested techniques, patterns, and methodologies for object-oriented software design.

My **course outline** intended to communicate with students unambiguously about teaching and assessing practices to fulfill a few core **conceptual and skill oriented learning outcomes**. To help students achieve these outcomes, I designed weekly **in-class activities**, take-home assignments, class tests and final examinations that were graded following logical **marking rubrics**, and are accompanied by feedback. I also conducted weekly consultation hours for students who needed some additional assistance. I tried to facilitate an environment that encourages students to get involved in understanding and applying effective ways to analyze and design object-oriented software.

**Laboratory Instructor at University of Windsor** (Winter 2011)

I conducted weekly lab sessions for the first year students of Key Concepts in Computer Science. I **actively engaged** students in applying the fundamental ideas of Computer Science to solve a variety of problems. My intention had been to encourage students about the importance of these ideas in the study of Computer Science by designing lab sessions that are related to their interests. I implemented **small-group problem solving sessions** in these labs so that students can collaborate in learning by exchanging constructive feedbacks.

**Graduate Teaching Assistant at University of Windsor** (2005 to 2010)

I assisted students in understanding difficult and fundamental topics by conducting consultation hours and tutorials on a weekly basis. Many of my work-hours were dedicated to helping instructors prepare assignments, and supervise laboratory sessions. I was responsible for administrative tasks such as invigilating and evaluating examinations, assignments and laboratory work. I assisted as a GA for the following courses:

*Computer Languages, Grammars, and Translators* (60-214)

- Winter 2009 (with Dr. Luis Rueda)

*Key Concepts in Computer Science* (60-100)

- Fall 2005, Fall 2006, Fall 2007, Fall 2008, Fall 2009 (with Dr. Richard Frost)
- Winter 2006, Summer 2006 (with Ms. Evia El-Habash)
- Winter 2007 (with Mrs. Ritu Chaturvedi); Winter 2010 (with Mr. Nabil Abdullah)

*Literature Review and Survey* (Graduate Course, 60-510)

- Winter 2008 (with Dr. Richard Frost)

*Computer Architecture I: Digital Design* (60-265)

- Winter 2005 (with Dr. Akshaikumar Aggarwal)

*Computer Networks* (60-367)

- Summer 2005 (with Mr. Randy Fortier)

### **Research Assistant at the Language Engineering Lab**

School of Computer Science (2005 to 2011)

Supervised by Dr. Richard A. Frost

- Besides conducting my own research, I assisted the research lab supervisor and the group discovering related research materials and publications, conducting surveys on related topics, writing and transforming program code, and building tools. I also edited and proofread the group's research papers using LaTeX.

- I have created a few web-based speech front end applications for NLP applications using VoiceXML and X + V (XHTML + Voice). ([cs.uwindsor.ca/~speechweb](http://cs.uwindsor.ca/~speechweb))

## EDUCATION

**PhD, Computer Science (2007 to 2011)** Successfully defended on 15th September 2011.

School Of Computer Science, University of Windsor, ON, Canada

Supervisor - Dr. Richard A. Frost

Current overall GPA - 12.76/13

Thesis project - *Executable Attribute Grammars for Modular and Efficient Natural Language Processing*. Project site: <http://cs.uwindsor.ca/~hafiz/xsaiga/proHome.html>

**Masters of Science, Computer Science (2005 to 2006)**

School Of Computer Science, University of Windsor, ON, Canada

Master's thesis - *Efficient Combinator Parsing for Natural-Language*.

**Bachelor of Science, Computer Science (2002 to 2004)**

School Of Computer Science, University of Windsor, ON, Canada

The goal of my research is to provide an **efficient** and **modular** framework for syntactic and semantic analyses of ambiguous languages (e.g., natural language). My work is based on our **general top-down parsing algorithm**, which I further extended to combine declarative **semantics of arbitrary dependencies with syntax** to model directly-executable language descriptions. I demonstrated how to constrain the generative limit of languages using semantics to capture linguistics phenomenon (e.g., unification, long-distance and cross-serial dependencies, etc.) that require **more restrictive formalisms than CFGs**.

I have formally showed that analyses methods are correct, they terminate, and need polynomial time and space at the worst case. The efficiency of the parsing algorithm has been tested using **practical** NL grammars (over 5000 rules), and with **massively-ambiguous** grammars. Using the declarative notation of my approach, I constructed domain-specific **NL query processors** that can answer hundreds of thousands of questions. These processors use context-free syntax and Montague-style **compositional semantics** for computing meanings. I integrated some of these processors within the SpeechWeb framework by creating **web-based speech front ends**.

The declarative notation of my work can be used to build general-purpose (potentially web-based) **NL interfaces and query processors**. My syntax-semantic interface can be expanded seamlessly for building **rule-based machine translation** applications. By taking advantage of the context-awareness and restrictive capability of my approach, a wide range of syntactic, semantic and word-sense **disambiguation** can be included in NLP applications.

**University Teaching Certificate (UTC) (2009 to present)**

*Fundamentals of University Teaching (Fall 2009 to Fall 2010)*

Centre for Teaching and Learning of University of Windsor, ON,

Accredited by Staff and Educational Development Association (SEDA), UK

I have completed two graduate courses (obtained A+ for both courses) and one short course, as part of the requirements, to obtain the first certification – **Fundamentals of University Teaching**. I designed a **well-aligned course on Functional Programming**, interpreted learning-centered and scholarly teaching practices in the context of Computer Science, applied effective lecturing methods, and constructed a teaching dossier (by participating into an internationally-recognized Teaching Dossier Academy) as part of the program. I was one of the first three graduates to obtain this SEDA accredited certificate in North America. My expertise as a team player was obvious during the period of this year-long program, which required **collaboration and facilitation** with instructors from various departments. My **teaching dossier** can be found at <http://cs.uwindsor.ca/~hafiz/Info/td.pdf>.

## HONORS and AWARDS

- **Ontario Graduate Scholarship (OGS)** - Yearly value of \$15,000.00 for May 2009 - April 2011.
- **Ontario Graduate Scholarship in Science and Technology (OGSST)** - Yearly value of \$15,000.00 for May 2007 - April 2009.
- **Doctoral Tuition Scholarship**, University of Windsor - For four years period of doctoral studies (2007 and onwards)
- **Graduate Tuition Scholarship**, University of Windsor - From January 2006 to December 2006
- **Graduate Achievement Award**, School of Computer Science, University of Windsor - For 2008 and 2009 academic years.
- One of the best three *student paper award* - 22nd Canadian Conference on AI 2009, Kelowna, B.C

## PEER-REVIEWED PUBLICATIONS

My research on syntactic and semantic analyses of natural languages have been described in eight peer-reviewed papers, which have been presented and published in some reputable conferences. My work has been *referred by language-technology and functional programming researchers*. In his important book "Parsing Techniques - A Practical Guide", distinguished researcher Dr. Dick Grune heavily cited our top-down parsing algorithm. Below is the list of publications:

- 1. Hafiz, R.** and Frost, R. (2011) *Modular Natural Language Processing Using Declarative Attribute Grammars*. 10<sup>th</sup> Mexican International Conference on AI, Puebla, 2011. LNAI 7094, Pages: 291–304
- 2. Hafiz, R.** and Frost, R. (2011) *A System for Modularly Constructing Efficient Natural Language Processors*. Computational linguistics-Applications Conference, Poland, 2011. (In press, 12 pages)
- 3. Hafiz, R.** Frost, R. (2010) *Lazy Combinators for Executable Specifications of General Attribute Grammars*. 12<sup>th</sup> Practical Aspects Declarative Languages, ACM-PADL, Spain. LNAI Volume 5937/2010, Pages: 167-182. (Collocated with ACM POPL 2010)
- 4. Hafiz, R.** (2009) *Executable Specifications of Fully General Attribute Grammars with Ambiguity and Left-Recursion*. 22nd Canadian Conference on AI, Kelowna, B.C. Pages: 274-278.
- 5. Frost, R., Karaki, A., Dufour, D., Greig, G., Hafiz, R., Shi, Y., Daichendt, S., Chandon, S., Barolak, J., and Fortier, R.** (2008) *MySpeechWeb: software to facilitate the construction and deployment of speech applications on the web*. ASSETS 2008, Pages: 249-250.
- 6. Frost, R., Hafiz, R.** and Callaghan, P. (2008) *Parser Combinators for Ambiguous Left-Recursive Grammars*. Proceedings of the 10<sup>th</sup> Practical Aspects Declarative Languages, ACM-PADL, San Francisco. LNAI Volume 4902/2008, Pages: 167-181. (Collocated with ACM POPL 2008)
- 7. Frost, R., Hafiz, R.** and Callaghan, P. (2007) *Modular and Efficient Top-Down Parsing for Ambiguous Left-Recursive Grammars*. Proceedings of the 10<sup>th</sup> ACL-IWPT. Pages: 109 - 120, June 2007, Prague. (Collocated with Association of Computational Linguistics 2007)
- 8. Frost, R. and Hafiz, R.** (2006) *A New Top-Down Parsing Algorithm to Accommodate Ambiguity and Left Recursion in Polynomial Time*. ACM SIGPLAN Notices, Volume 41 issue 5, Pages: 46 - 54.

## POSTER PRESENTED IN CONFERENCES

1. **Hafiz, R.** (2009) *Executable Specifications of Fully General Attribute Grammars with Ambiguity and Left-Recursion*. 22nd Canadian Conference on AI 2009, Kelowna, B.C. (PhD work)

## NON-REFEREED CONTRIBUTION

1. Frost, R., **Hafiz, R.** and Callaghan, P. (2008) *The X-SAIGA Project*. Haskell Communities and Activities Report. Fourteenth edition – May, 2008.

2. Frost, R., **Hafiz, R.** and Callaghan, P. (2008) *The X-SAIGA Project*. Haskell Communities and Activities Report. Fifteenth edition – November 2008.

## TECHNICAL SKILLS

Functional programming languages	- Haskell and Miranda
Object-oriented programming languages	- Java and C++
Web-related scripting and programming languages	- JSP/Servlet, HTML, CSS
Internet-based speech technology languages	- VoiceXML, X + V (XHTML + Voice),
Database related languages	- SQL/ PLSQL, Oracle RDBMS
Statistical and mathematical languages and tools	- Maple and SPSS
Document mark-up language	- LaTeX

Even though I used lazy functional languages (e.g., Haskell) for technical reasons in my research, I am fluent in Object-oriented languages especially in Java. I **taught Object-Oriented Software Analysis and Design (using Java)** during the summer and fall of 2010 to upper-year CS students to help them learn and apply effective software design practices, design patterns, and Agile methodologies such as Unified Process and Extreme Programming. Using VoiceXML and X + V (XHTML + Voice), I have built speech front ends for natural language query processors, where the back end is constructed using my declarative notation for syntactic and semantic analysis.

## COMMUNITY INVOLVEMENT and VOLUNTEER WORK

-I had the opportunity to chair the **4<sup>th</sup> Computer Science Conference**, University of Windsor 2010 (<http://cs.uwindsor.ca/csc2010/>). In addition to organizing and hosting the day-long event for the graduate students and faculty, I was also a member of the program committee to review and select research papers from CS graduate students.

-I facilitated a workshop **“Effective communication: the key to excellent explanations”** during the GATAcademy 2010 and 2011 for Science and Engineering graduate teaching assistants, which was organized by the Centre for Teaching and Learning of the University of Windsor. I taught participants how to explain difficult topics by understanding students’ perspectives, and by recognizing and utilizing students’ prior knowledge and skills.

-I represented graduate students at Tenure and Promotion Committee, at the Centre for Teaching and Learning of the University of Windsor.

## **MEMBERSHIP**

- ACM Professional Member since April 2010
- Microsoft Certified System Engineer(MCSE) (2000)
- Golden Key International Honour Society

## **CONTRIBUTIONS RESULTING from MY WORK in RELEVANT R&D**

The top-down parsing algorithm for accommodating general context-free grammars (including left-recursive grammars), which I jointly developed with my PhD supervisor Dr. Richard Frost, has found application in practice. This algorithm is cited and has been implemented by the developers of the widely-used Python parser library called LEPL. More can be found about this library at <http://www.acooke.org/lepl/implementation.html>.

## **REFERENCES**

Will be provided upon request.