University Classification: Assistant Research Scientist

UI Job Code: PRJ1

Job Function: Research

Job Family: Research Scientist

Working Title (if applicable): Assistant Research Scientist

Position #: 00199242

Org/Dept/Sub-dept #: 11-1110

This Position Reports to (Name and Position #): Aaron Stump (00103176)

Does this position have Administrative Supervision?  N

Position Specific Summary: This is a position in the Computational Logic Center led by Professors Aaron Stump and Cesare Tinelli. The position is to take a leading role in the development of the Cedille interactive theorem prover, and conduct new research in dependent type theory, lambda calculus, and related topics in the areas of Computational Logic and Programming Languages.

Key Areas of Responsibilities and Specific Job Tasks

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<tr>
<th>Classification Key Areas of Responsibilities</th>
<th>Specific Job Duties and Tasks</th>
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<tbody>
<tr>
<td>Experiments, Simulations, Modeling or Theoretical Investigations</td>
<td>Extends the Calculus of Dependent Lambda Eliminations (CDLE), the theoretical basis for Cedille. Conducts research studies on new formalization techniques and advanced programming methods, using Cedille. Develops and adapts advanced features for the Cedille implementation, including automated reasoning, type inference, abstract machines, and related methods.</td>
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<tr>
<td>Data/Research Analysis and Evaluation</td>
<td>Evaluates Cedille on advanced examples, such as formalization of the theory of lambda calculus, abstract machines and reduction strategies, and related results in theoretical Computer Science. Explores possible new connections to computational classical type theory.</td>
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| Dissemination of Research Results | • Takes a leading role in writing papers for publication about the results obtained in the project.  
• Travels to workshops, conferences, and other professional venues to present project results, and make formal and informal connections with other researchers in the field.  
• Presents results locally, regionally, nationally and/or internationally. |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Research Proposals/Grants       | • Prepares grant proposals in either a supporting or leading role.  
• Participates in project meetings with external collaborators or funding agencies.  
• Coordinates work with external collaborators in sponsored projects as need arises.  
• Seeks out new funding opportunities in the area of the project or related areas. |
| Service                          | • Reviews conference and journal submissions in areas of expertise.  
• Participates in conference program committees.  
• Attends conferences, invited workshops and seminars in the discipline.  
• Contributes to research community-level activities such as interoperability efforts. |
| Human Resources/Supervision     | • Co-supervises junior researchers such as graduate and undergraduate students in various projects. |
| Universal Competencies          | • Adjusts to and develops self to prepare for new or changing assignments, processes, people, and priorities as organizational needs dictate.  
• Sets clear expectations for self and team to achieve work objectives and overcome obstacles.  
• Strives for excellence in performance by upholding established ethical standards and upholding university values |
| Service Excellence /Customer Focus (Basic Application) | • Consistently provides excellent service.  
• Communicates understandably; uses appropriate words, grammar and mannerisms in all mediums.  
• Seeks feedback on communication style and effectiveness. |
| Collaboration and Embracing Diversity (Basic Application) | • Demonstrates civil and respectful behaviors valued within the organization.  
• Provides and accepts ideas and suggestions in a constructive and helpful manner.  
• Exhibits good teamwork: is approachable, cooperative, and contributes to an overall positive and productive work/team environment.  
• Works effectively with individuals from all backgrounds. |

**Technical Competencies**

| Qualitative Research (Extensive Experience) Knowledge of and ability to gain insights concerning attitudes, beliefs, motivations and behaviors as part of a research study. | • Identifies new problems in the field, making connections across subfields.  
• Proposes new directions and methodologies for problems identified.  
• Demonstrates awareness of different trends and lines of research. |
| Quantitative Research (Extensive Experience) Knowledge of and the ability to use numerical methods to compile information about a given situation or condition. | • Applies formal techniques with precision to problems related to lambda calculus.  
• Devises new abstractions for solving such problems.  
• Writes computer software in appropriate languages to demonstrate new techniques or implement a new language. |
| Research Analysis (Extensive Experience) Knowledge of and the ability to locate, interpret and evaluate research findings compiled and documented by others and use this material to support empirical research. | • Analyzes and critiques published research on lambda calculus and related fields.  
• Demonstrates mastery of a broad range of both classic and more recent literature related to lambda calculus.  
• Evaluates current research trends in light of deeper analysis of the literature. |

| Research Documentation (Working Experience) | • Assists in the preparation of research report, papers and tool documentation. |
Knowledge of and ability to utilize tools and techniques for producing well-written, meaningful and usable documentation of research findings.

- Prepares detailed companion reports with complete formal details, in support of works submitted for publication.

**Conceptual Thinking (Working Experience)**

Identifies the critical ideas and interdependencies among system elements that impact performance.

- Identifies critical new concepts to unify different theoretical approaches.
- Demonstrates facility in understanding advanced new concepts.
- Makes use of a very high level of logical rigor and sophistication in formulating new ideas.

**Effective Presentations (Working Experience)**

Knowledge of effective presentation tools and techniques; ability to present information to groups with the appropriate degree of formality.

- Prepares and delivers formal presentations to a variety of audiences with different level of technical knowledge in lambda calculus.
- Demonstrates ability to present results of others with appropriate context for the audience.
- Is able to explain complex new research results with appropriate technical presuppositions.

**Engineering (Working Experience)**

Knowledge of and experience with designing, testing and fabricating components, devices and other projects.

- Designs, writes and tests computer software aimed at implementing and evaluating new ideas in lambda calculus and/or type theory.
- Exhibits a high degree of competency in software engineering tools, methods, and languages.
- Is capable of making informed decisions in choice of tools and languages.

**Research and Verification (Working Experience)**

Knowledge of tools, techniques and resources for obtaining or validating information to be published, exhibited or presented in a variety of methods.

- Can carry out fully detailed logical proofs of results obtained.
- Is able to write up such proofs according to the highest standards of the field.
- Formalizes critical developments using interactive theorem provers.

As part of performing the key areas of responsibility and competencies described above, staff members are expected to meet reasonable standards of work quality and quantity, as well as expectations for attendance established by their supervisor. Staff members are also expected to comply with policies governing employee responsibilities and conduct, including those contained in the University Operations Manual.

**Position Qualifications**  
(This section only needs to be completed when recruiting for the position).

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<th>Education or Equivalency Required</th>
<th>PhD in Computer Science or closely related discipline, or equivalent combination of education and experience.</th>
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<tr>
<td>Required Qualification</td>
<td>Substantial expertise and experience in theory and practice of lambda calculus and/or related topics; typically 1-3 years.</td>
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<tr>
<td>Required Qualification</td>
<td>Strong background in computational logic and programming languages, as evidenced by a dissertation on this topic and/or peer-review publications.</td>
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<tr>
<td>Required Qualification</td>
<td>Working experience developing new theoretical ideas and results in lambda calculus and related areas.</td>
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<td>Required Qualification</td>
<td>Demonstrated working ability and experience to work in a diverse and collaborative environment.</td>
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<td>Required Qualification</td>
<td>Excellent written and verbal communication skills, as demonstrated at a working proficiency level.</td>
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<td>Desirable Qualification</td>
<td>Prior experience with assisting in securing external grant funding.</td>
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<td>Desirable Qualification</td>
<td>International connections with notable research groups in the field.</td>
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<tr>
<td>Desirable Qualification</td>
<td>Recognized leadership in the field such as invited talks, program committee membership, and participation in invitation-only workshops and seminars.</td>
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<tr>
<td>Desirable Qualification</td>
<td>Functional programming experience (OCaml, Haskell, Agda, etc.) and/or interactive theorem proving experience (Coq, Isabelle, etc.)</td>
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