Holger Stadel Borum

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I am a PhD student at the IT-University of Copenhagen. I am interested in applying programming language theory such as type systems, code analysis, and transformation to real world problems. This leads to a natural interest for domain specific languages and spreadsheets. I also have an interest in algorithms and computational theory, games, and AI for games.

Education

Computer Science, PhD+MSc, *ITU*, Copenhagen, . **2018-22**
My project is about designing and implementing DSLs for the pension industry and seek to apply and develop programming language theory in this process.
Supervisor: Peter Sestoft

Computer Science, MSc, *University of Copenhagen*. **2017-18**
Credits transfered to my combined master and PhD at ITU.

Games, Master, Not finished, *ITU*, Copenhagen. **2016-17**
I did not finish these studies because I was missing computer science.

Software development, BSc, *ITU*, Copenhagen. **2013-2016**
Bachelor thesis about parallelization of a computation on a GPU using the CUDA platform.

Experience

Project work

Research programmer, *Spreadsheet*, Funcalc. **2016-2018**
Maintaining and developing Funcalc which is a spreadsheet developed by Peter Sestoft in cooperation with others. I implemented at bridge from Excel to Funcalc, looked at minimal recalculations for function modifications, implemented the data structure QuadRopes, and looked at property based testing of the system. `http://www.itu.dk/people/sestoft/funcalc/`

Application system, *Web development*. **2016**
An application system developed for the residence hall Studentergården. The entire process from making the initial offer and requirement elicitation to hosting and maintenance.

Floralia, *Game*. **2013-2018**
Floralia is a large game I have been working on with Malte Burup since 2013. Which unfortunatly is unlikely to be finished.
`www.floralia.blaavogn.dk`

Studentergården, *Web development*. **2013-2015**
Created a new simple CMS-system for the residence hall and made maintenance of an old infrastructure.

Implemented small video games. **2012-2016**

11Time, *Webdevelopment*. **2011-2012**
Part time development in PHP.

Teaching

Teacher, *Programs as data*, ITU. **2018**
Held a recap lecture about polymorphic type inference and Regex→NFA→DFA transformation. Also responsible for exercise classes and assignment feedback

Guest Lecture, *Systematic Design of User Interfaces*, ITU. **2017**
About how I used the methods from the course when designing `ansogning-sg.dk`

Teaching Assistant, *Mobile and Distributed Systems*, ITU. **2015,2016**
Responsible for exercise classes, giving feedback on assignments, and creating some assignments.
Introduction to protocols, distributed architectures, consensus & agreement, security and concurrency handling.
Course Manager: Søren Debois

Teaching Assistant, *First-year Project: Map of Denmark: Visualization, Navigation, Searching, and Route Planning*, ITU. **2016**
Being a supervisor for groups during their first year project. The project involves searching in graphs, partitioning and visualizing a large data-set, and project planning/execution.
Course Manager: Troels Bjerre

Teaching Assistant, *Systematic Design of User Interfaces*, ITU. **2016**
Responsible for exercise classes and giving feedback on assignments.
Course Manager: Søren Lauesen

Voluntary teacher, *Public library*. **2018-2019**
Helping often vulnerable primary school students with their homeworks biweekly.

Organizational

Co-founder of Chill Factor I/S. **2016**
A software company I created with two partners.

Netgårdmester, *Studentergården*. **2014-2015**
Resident representative at the board of the hall of residence with different everyday tasks.

References

Professor Peter Sestoft, *sestoft@itu.dk*.

Associate professor Søren Debois, *debois@itu.dk*.

Theoretical background

Computer Science
I am finishing my master in Computer Science with a specialization in programming languages. Concretely I have studied:

- Partial evaluation
- Randomized algorithms
- Functional languages
- Computational and complexity theory

Which I believe to provide me with some background knowledge for the projects about.

- Partial evaluations, the bar construction, and second-order stochastic dominance
- Traversal optics and profunctors
- Complexity classes, computation, and Turing categories

Category Theory
I have no background in category theory but I am reading "Category Theory for the Sciences".

PhD information

I am designing and implementing domain specific languages for the pension industry, and I seek to apply and develop programming language theory in this process. The project runs from the summer 2019 to the summer of 2022.

Project preferences

1. Partial evaluations, the bar construction, and second-order stochastic dominance
2. Traversal optics and profunctors
3. Complexity classes, computation, and Turing categories
4. Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces
5. Toward a mathematical foundation for autopoiesis
6. Simplifying quantum circuits using the ZX-calculus

Funding

I do have funding which can cover at least travel and accommodation.

IT University of Copenhagen

To whom it may concern

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30 January 2019

Holger Stadel Borum's application

It is my pleasure to recommend my PhD student Holger Borum for the ACT2019 summer school.

I came to know Holger in early 2016 when supervising his bachelor project about using general purpose graphics processors (GPGPU) to numerically solve certain differential equations in the domain of pensions and life insurance. He invented and conducted a range of experiments to pinpoint the performance bottlenecks in such computations.

Subsequently he worked as a research programmer in my research project on parallel spreadsheet implementations (on shared memory multicore hardware, very different from GPGPU), in which role he collaborated with other students and maintained a large and complex code base.

Now I am supervising his PhD on domain specific languages in the pension and life insurance industry.

During the time I have worked with Holger, he has been eager to explore the theoretical foundation of programming languages. Becoming more acquainted with category theory is a natural progress in this exploration and useful for his research.

On a more personal note, I know that Holger works well with others on projects, is highly motivated to learn new theory and technology, and also punctual and hard working.

Yours sincerely,

Peter Sestoft
Head of Department
Professor, PhD

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