



Jacob Toft Pedersen

Curriculum Vitae

Personal information

Birthdate 28'th December 1977

Civil Status Married to Helle, father to Mads and Laura.

Profile I am currently pursuing a PhD-degree in Computer Science. The last two years I have done research in Computer Graphics, developing and examining algorithm's for global illumination using density estimation (Photon Mapping).

In my studies I focus on algorithms, computer graphics and image processing. I find joy in implementing algorithms and techniques and I often find a way to utilize any new gained knowledge in my hobby projects. This has given me solid experience in programming.

Besides programming I have been known to pick up tools and build machines and circuits in my spare time. I have build a CNC machine, made additions for printing with frosting and drawing on eggs. The latest project is building an autonomous rig to do kite aerial photography.

Jernaldervej 223B st. th. – 8210 Århus V

☎ 22777440 • ✉ jtp@cs.au.dk • 🌐 cs.au.dk/~jtp

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Work Experience

2012 - now **PhD - research**, *Aarhus Universitet*, Aarhus, 2 years.

Supervisor: Toshiya Hachisuka

I work with implementations in C/C++ of different algorithms and data structures. I examine and optimize their performance, while keeping the visual fidelity in mind.

General Experience with implementing multithreaded computational intensive algorithms.

- Many experiments where core parts of algorithms has been isolated and simplified to 1D/2D to ascertain feasibility and gain insights.
- Python scripts to run test cases, do measurements on error and to generate reports.
- Knowledge and experience using linux tools (i.e. `bash/sed/awk/gnuplot`).
- Profiling and debugging, using `valgrind`, `kcachegrind`, `gprof`, `GDB`.

Project Hierarchical Progressive Photon mapping

- Used *Embree*: Intels highly optimized raytracing kernels, a lean collection of tools to implement rendering algorithms.
- Implemented density estimation algorithms (photon mapping and progressive photon mapping).
- Introduced and approximate agglomerate clustering to select best balance between noise and bias.

Project Multidimensional Photon Caching Toward Efficient Photon Density Estimation

- Used *Mitsuba*: a large flexible object oriented C++ framework with implementations of state of the art rendering algorithms.
- I changed core parts of the framework and learned how to work with a large code base.
- Used Z-order curves to do fast lookups and interpolation of a multidimensional vector function.

Project a Genetic Optimization to generate Physically Plausible BRDFs

- Implemented a system to evolve expressions and evaluate their fitness using Monte Carlo Integration. (C using `pthread`).
- Just-in-time compilation of mathematical expressions using `libjit`.
- *Evolving, pruning* and constant folding AST's. Parsing S-Expressions.

2012 - now **Teaching Assistant**, *Aarhus University*, Aarhus.

Managed exercise sessions, helped students understand and solve exercises, this has led to a thorough understanding of the core concepts from the courses.

I have learned to give honest and constructive feedback, by giving feedback on weekly handins. Honest as I am not afraid of saying if it is unacceptable, constructive as I want students to learn; and I dislike seeing the same mistake over and over.

Courses:

- Perspectives in Computer Science
- Algorithms and Data structures I
- Algorithms and Data structures II (two times)
- Introduction to Computer Graphics and Image Processing

2001 - 2002 **Warehouse Operative**, *Conway transport*, Aarhus, 10 months.

Distributing furniture from factory trucks to delivery trucks. Had a large responsibility and was required to keep the overview. It was physically hard work with long hours.

1999 - 2000 **Conscientious Objector**, *Beboernes Hus*, Aarhus, 9 months.

Community center doing PR and management work.

1995, 1999 **Able seaman**, *Fabricius Bjerre & Co, CJ Helt & Co*, America, Europe og Africa, 6 and 4 months contracts.
Working on a commercial vessel, and transported *everything* from emergency aid to potatoes for McDonalds. I worked in an international environment doing manual labor.

Education

2012 - now **PhD studies**, *Aarhus Universitet*, Aarhus.
Transferred from Master studies, before finishing the degree.

2010 - now **Master(Honours) Computer Science**, *Aarhus Universitet*, Aarhus.
Expected completion fall 2014

2006 - 2010 **Bachelor Computer Science**, *Aarhus Universitet*, Aarhus.
With external courses in math and engineering

1995 - 1998 **Mathematical student**, *Århus Studenter Kursus*, Aarhus.
Highschool equivalent

IT and programming

Languages	C++, C, Python, Java, Bash, PHP, SQL etc	IDE's	Emacs, Eclipse, Visual Studio
VCS's	Git, SVN, Mercurial	Typography	ℒ _A T _E X
Admin	Linux servers with Git, SVN, email(postfix+dovecot), Webserver(LAMP), remote backups(ssh+rsync)	Root	on my PC, Phone, NAS, router, server

Volunteer Work

2009 - now **Board Member**, *Open Space Aarhus*, Aarhus.
Open Space Aarhus is a *hackerspace* - a physical place to facilitate general nerdiness. I took initiative to start *Hack Aarhus* which evolved into Open Space Aarhus. It has grown into a healthy organization with 70+ paying members and 300+ supporters. We have a 200m² workshop with tools for all kinds of mechanical and electronic work.
Apart from running the facilities we organize a popular monthly night with lightning talks, T³:Tech Talk Tuesday.

2013 **Artist**, *Click Festival*, Helsingore.
Exhibited a project, *From Asia With Love*. A system that uses Amazons Mechanical Turk to buy gifts from China to participants along with a personalized message.

2011 **Lecturer**, *Open Space Aarhus*, Aarhus.
Along with two others, I made a small *introduction to graphics programming* course based on processing.org

Interests

Programming General programming challenges (Online Judges) to *sharpen the saw* and have fun. Projects with Fractals, Stange Attractors, L-systems, algorithmic art, websites and small games.

CNC I built an CNC machine, with extensions. Capable of milling wood and plastic subjects measuring 15x35x70cm.

Electronics Occasionally I solder and program micro-controllers, the latter is what I do best.
KAP Kite Aerial Photography, which an interesting combination of flying a kite and building a automated rig to take pictures from above.
Vintage Has been a volunteer worker, seaman, ships mate and captain on the fishing vessel
Fishing vessel Anna Nyborg since 1983. Anna Nyborg was built in 1929.