

Niels Justesen | Curriculum Vitae

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Ph.D. fellow at the IT University of Copenhagen

Education

IT University of Copenhagen

Copenhagen, Denmark

Ph.D., Computer Science

2016–2019

Supervised by Sebastian Risi, I am working on deep learning and evolutionary algorithms for strategy game playing.

IT University of Copenhagen

Copenhagen, Denmark

Master of Science, Games Technology

2012–2015

With courses such as *Modern AI for Games, Game Engines, Data Mining, Game Design* etc.

IT University of Copenhagen

Copenhagen, Denmark

Bachelor of Science, Software Development

2009–2012

For a complete list of courses passed, please see my LinkedIn profile <https://www.linkedin.com/in/niels-justesen-7b37042a/>.

Current research

At the IT University of Copenhagen I am investigating how deep learning in combination with online evolutionary planning can be used to play strategy games. My focus so far have been on multi-action adversarial games, such as Hero Academy, and the real-time strategy game StarCraft. I am investigating (1) supervised learning methods, where a neural network learn to predict actions of human players, (2) deep reinforcement learning methods, where a neural network is trained from self-play or against other artificial agents, and (3) online evolutionary planning algorithms that can evolve action sequences in games with large branching factors. My publications are listed in the end of this document.

Master thesis

Title: *Artificial Intelligence for Hero Academy*

Supervisors: Tobias Mahlmann and Julian Togelius

Description: In this thesis we have focused on how to create an intelligent AI agent for the tactical turn-based game Hero Academy. In this game, players can perform five sequential actions resulting in millions of possible outcomes each turn. We have implemented and compared several AI methods mainly based on Monte Carlo Tree Search (MCTS) and evolutionary algorithms. An online evolutionary algorithm that evolves plans during each turn achieved the best results.

Experience

Vocational.....

IT Minds

Copenhagen, Denmark

Senior Software Developer

2012–2016

My responsibilities as a Senior Software Developer were:

- Development, Architecture, and test of in-house projects.
- Consultancy at customers.
- Project estimation, customer dialogue, and help ensure the best possible solution for our customers.
- Responsible for the quality and delivery of own projects.
- Mentoring, knowledge building and sharing internally Responsibilities.

Tegma ApS

Jystrup, Denmark

Web Developer

2011–2012

Management, design and development of several web shops and web sites.

Tego Tech Sikkerhedsmateriel ApS

Jystrup, Denmark

Web Developer

2006–2011

Management, design and development of several web shops and web sites.

Languages

Danish: Native

English: Professional working proficiency

German: Elementary proficiency

Publications

Journal Articles.....

Niels Justesen, Tobias Mahlmann, Julian Togelius and Sebastian Risi: Playing multi-action adversarial games: online evolutionary planning versus tree search. *IEEE Transactions on Computational Intelligence and AI in Games (TCIAIG)*. 2017.

Refereed Conference Papers.....

Niels Justesen and Sebastian Risi. Automated Curriculum Learning by Rewarding Temporally Rare Events. *IEEE Conference on Computational Intelligence in Games (CIG)*. 2018.

Niels Justesen and Sebastian Risi. Learning macromanagement in StarCraft from replays using deep learning. *IEEE Conference on Computational Intelligence in Games (CIG)*. 2017.

Niels Justesen and Sebastian Risi. Continual online evolutionary planning for in-game build order adaptation in StarCraft. *Proceedings of the Conference on Genetic and Evolutionary Computation (GECCO)*. ACM, 2017.

Niels Justesen, Tobias Mahlmann, and Julian Togelius. Online evolution for multi-action adversarial games. *European Conference on the Applications of Evolutionary Computation*. Springer International Publishing, 2016.

Niels Justesen, Bálint Tillman, Julian Togelius, and Sebastian Risi. Script-and cluster-based UCT for StarCraft. *IEEE Conference on Computational Intelligence and Games (CIG)*, 2014.

Press Coverage

English.....

New Scientist: [DeepMind dojo will train AI to beat human StarCraft players](#), 2017

Danish.....

Berlingske: [Google-algoritme knækker på tre dage koden til brætspil, det har taget mennesker 2.500 år at udvikle](#), 2017

P1: [Orientering 18. OKT. 2017](#), 2017

Version2: [Version2 vs. ITU's StarCraft AI: Deep learning giver en helt anden spiloplevelse](#), 2017

Version2: [ITU-forsker inviterer til Kulturnatten: Kom og spil StarCraft mod neuralt netværk](#), 2017

ITWatch: [Kunstig intelligens skal udmanøvrere menneskelige Starcraft-strateger](#), 2017

Invited talks

"Deep Learning for Video Game Playing". **Invited talk**, SKAT, Nov. 22nd 2017.

"Learning Macromanagement in StarCraft from Replays using Deep Learning". **Invited talk**, ASYNC: Asynchronous Research on AI & Games, MetaMakers Institute (Online Conference), Oct. 25th 2017.

"Deep Reinforcement Learning". **Invited talk**, Danish Embodied Artificial Intelligence Workshop, Odense, Nov. 10th 2016.

"Online Evolution for Hero Academy and Multi-Action Games". **Invited talk**. nucl.ai Conference in Vienna, July 18th 2016.

Grants and Awards

In 2018, I was awarded the EliteForsk (Elite-Research) travel grant of 200,000 DKK (approx. 32,195 USD).

Research Stays

I have been a visiting researcher at the Game Innovation Lab at the NYU School of Engineering from March to June 2018, working with Professor Julian Togelius and the lab's students and researchers.

Reviewer

I have reviewed for:

- *IEEE Transactions on Computational Intelligence and AI in Games*.
- *The Genetic and Evolutionary Computation Conference (GECCO)*, 2018.
- *Conference on Computational Intelligence and Games (CIG)*, 2018.

Organisational Activities

- *Program Committee member of the Conference on Computational Intelligence and Games (CIG)*, 2018.
- *Track Chair of the special session "Deep Learning in Games" at the Conference on Computational Intelligence and Games (CIG)*, 2018).
- *Organizer of the StarCraft AI Workshop at the IT University of Copenhagen*, 2018, with around

60 participants..

Teaching & supervision

Teaching.....

- Guest lecturer in *Modern AI for Games*. ITU, Copenhagen, Fall 2016.
- Lecturer in *Modern AI for Games*. ITU, Copenhagen, Fall 2017.

Supervision.....

- Currently co-supervising 5 master and bachelor students working on AI for StarCraft.
- Supervised 2 master students and 2 bachelor students.

Software released

- **Hero Alcademy:** a Java clone of the video game Hero Academy. The game is optimized for simulations and game AI research. Released in 2015. Website: <https://github.com/njustesen/hero-academy>.
- **JarCraft:** a StarCraft combat simulator based on the SparCraft project, that can be used as a forward model for StarCraft bots. Released in 2014. Website: <https://github.com/tbalint/JarCraft>.
- **Online Blood Bowl League Manager (OBBLM):** the most widely used way of managing teams and statistics for the tabletop game Blood Bowl. Released in 2007. Website <https://github.com/nicholasmr/obblm>.