

WASP | WALLENBERG AI, AUTONOMOUS SYSTEMS AND SOFTWARE PROGRAM

Industrial PhD Student Seminar

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Background



Why?

Something is happening: Self-Driving cars, Watson, AlphaGo, Alpha Zero (Schack), Google Translate, Drones, Industry 4.0, Industrial Internet Consortium, ...



Wallenberg AI, Autonomous Systems and Software Program

2015, September 6, start:

Largest individual research program in Sweden ever:
1815 MSEK for 10 years

Knut and Alice Wallenberg foundation(1315 MSEK),
Universities (200 MSEK), Industry (300 MSEK)

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Wallenberg AI, Autonomous Systems and Software Program

2017, November 14:

1000 MSEK more for AI from KAW
(plus in-kind from universities and industry)

2018, March:

295 MSEK more from KAW until 2026 with 150 MSEK for AI
including collaboration with NTU Singapore
(plus in-kind from universities and industry)

Total 2018 budget 3.5 billion SEK (with 2.6 billion from KAW)

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WASP

Wallenberg AI, Autonomous Systems and Software Program

Largest individual research program in Sweden ever

- 3.5 billion SEK (more than \$ 400 million) for 11 years

Knut and Alice Wallenberg foundation, Universities, Industry

Vision - Excellent research and competence in artificial intelligence, autonomous systems and software for the benefit of Swedish industry. (The word “industry” in its English meaning, for example including the financial industry.)

Mission - Build a world leading platform for academic research that interacts with leading companies in Sweden to develop knowledge and competence for the future.

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WASP Main Instruments

A **research program** with the best researchers in the field.

Recruitment of both leading and young researchers. (Nine in place; more than 50 in total)

A **graduate school** in close interaction with Swedish industry. (At least 350 PhD with at least 100 industrial PhDs)

Arenas for research and demonstration in collaboration with industry and other parties.

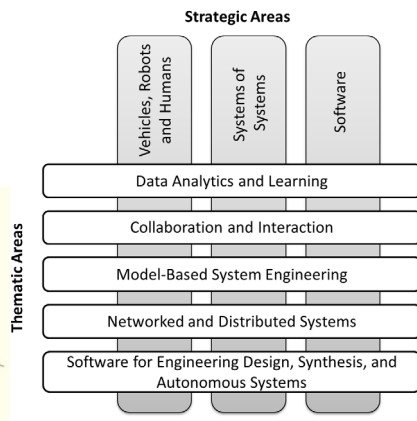
Internationalization; Stanford, Berkeley, NTU

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Structure of Research Program



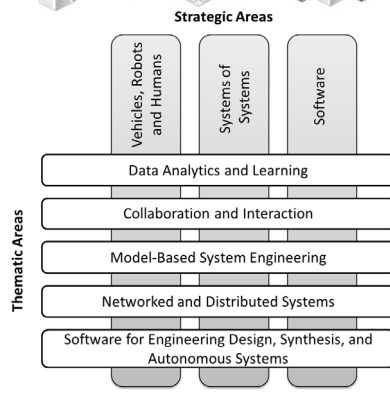
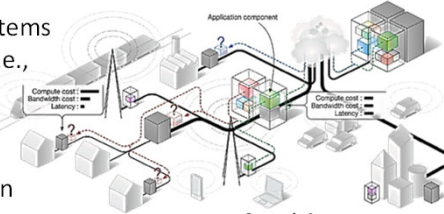
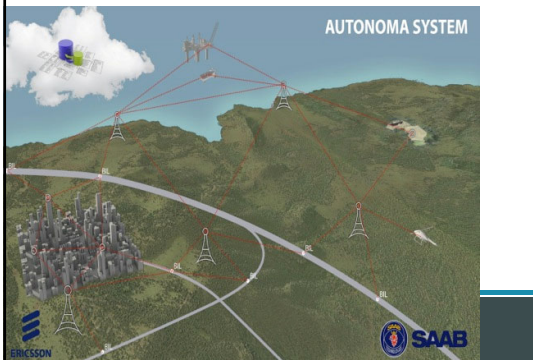
- Original WASP research ambitions stand
- A number of industrially motivated visions
 - A number of scientific trends



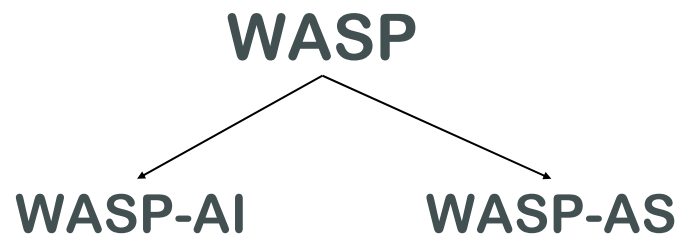
Structure of Research Program

To manage the complexity, System-of-Systems has to have a certain level of autonomy, i.e., be self-organizing and capable of independent decision making

Now focus on starting and integrating AI in research and all other aspects of WASP.



Graduate School



- One graduate school with two tracks

PhD Student Courses

- A PhD education consists of two parts:
 - Research that leads to a PhD thesis
 - PhD Courses
- Typically around 90 credits worth of courses (1.5 years full time)
- The majority of the courses are given by the local department or university
- Some of them are given by the WASP graduate school
 - 25-27 credits, corresponding to 4-5 courses

Graduate School

Joint effort to raise knowledge level in Sweden in interaction with Swedish industry.

First WASP-AS batch; 62 PhD students started 2016

- 24 university PhD students
- 23 industrial PhD students
- 15 affiliated PhD students

Second WASP-AS batch PhD students; 52 started 2018

- 25 university PhD students
- 21 industrial PhD students
- 6 affiliated PhD students

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Graduate School

First WASP-AI batch: 62 PhD students starting 2019

- 37 university PhD students (33 in place)
 - 20 AI/MLX
 - 17 AI/Math
- 14 industrial PhD students
- 11 affiliated PhD students

Third WASP-AS batch: 50-60 students to start 2020

- **22 industrial PhD students - this call**
- 20-25 university PhD students
- Affiliated PhD students

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Industrial PhD students

- Currently 59 PhD students from 27 different companies
- Large involvement
 - Ericsson 9
 - Saab 8
 - Zenuity 6
 - ABB 5
 - Astra Zeneca 3
- 16 companies have only one PhD student each
- For several companies this is their first industrial PhD student

WASP Industrial PhD Students

- Employed by a company
- PhD studies at a university department of a WASP university
- Four years if 100% research
- Five years if 80% research (20% for other non-research related tasks at the company) - the normal case
- The companies receives 600k SEK / year from WASP (100%) or 480k (80%)
 - Includes a travel budget of around 30k / year
 - The PhD student should be able to travel also if the company has a travel ban
- The PhD student has an university PhD advisor and an industrial PhD advisor (ideally a person with research experience)

- In average industrial PhD student projects and theses are slightly more applied in nature than university PhD student projects
- An ideal PhD student candidate should have a couple of years of experience of the company but still have the graduate education fresh in mind.

Several Questions and Issues

- How set up and execute an industrial PhD project so that the chances for success are maximized?
- How should the project topic be defined?
 - Sufficiently long-term so that the results still are of value to the company after five years
 - Sufficient research depth for publication
- How handle deviations?
 - Very few PhD students end up with a thesis that is exactly about the problem that was initially formulated
 - Deviations occur due to several reasons

Several Questions and Issues

- What is the objective for the company?
 - Solve a challenging problem
 - Increase the knowledge within an area that is of relevance to the company
 - Competence buildup for a promising employee
 - Obtain persons with sufficient skills to take a leading R&D role after 5 years
 -

Several Questions and Issues

- The company must be aware of the realities of PhD studies
 - Around 1.5 years full time are spent on taking courses
 - Some of the courses may be of less interest to the company but they must still be taken
 - An important part of the studies consists of travels to conference, summer schools, meeting or different kind, in order to discuss, present, and learn

Several Questions and Issues

- How should one guarantee that the PhD student remains to be relevant to the company during these five year?
 - Involved in a research-related "shadow" project where intermediate research results can be evaluated and which can generate new research questions
 - Formalize the knowledge transfer using, e.g., regular presentations by the PhD student at the company

Several Questions and Issues

- How can we be sure that the PhD stays with the company afterwards?
 - Well,

Today's Objective

- These are some example of questions that we will ventilate and discuss today
- Program:
 - 10:00-10:20 Introduction WASP och WASP's industrial PhD student program
 - 10:20-11:05 Claes Lundström, Sectra
 - 11:05-11:50 Karl Henrik Johansson, KTH
 - 12:00-13:00 Lunch
 - 13:00-13:45 Lars Hultman, SSF
 - 13:45-14:30 Maureen McKelvey, GU
 - 14:30-15:00 Discussion