

Robotics and
Embedded Systems



Seminar

Context Prediction in Autonomous Driving

M.Sc. Sina Shafaei

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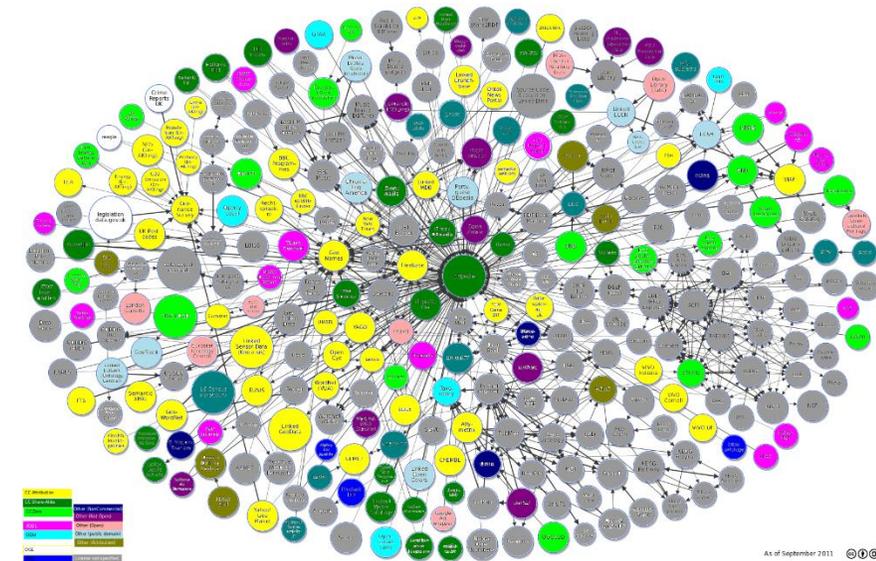
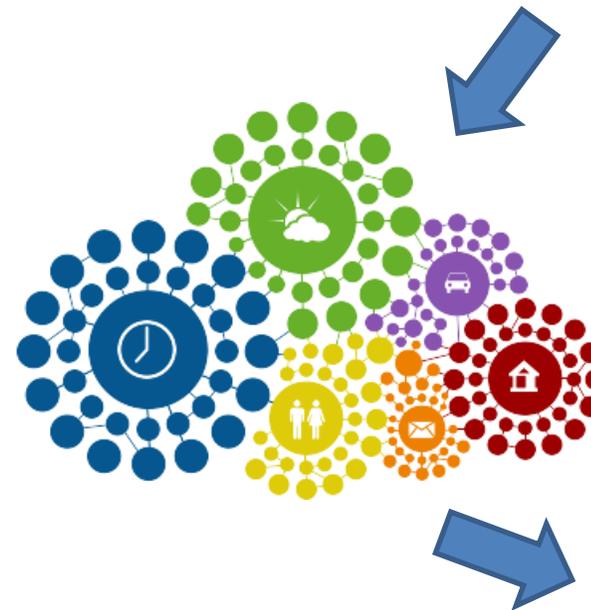
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WS 2017-2018



Context – The Meaning of Data

➤ By Changing the Perspective on Data and the Way We Interpret the Numbers, We Define Context on Data



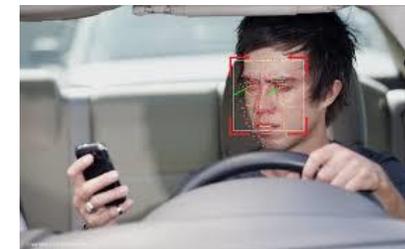
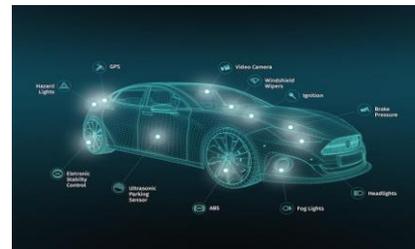
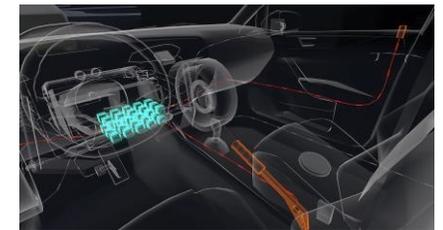
As of September 2011 ©

Definition of Context

“Any Information That Can Be Used to Characterize the situation of an Entity Is Called Context”

Context Related Topics in Autonomous Driving

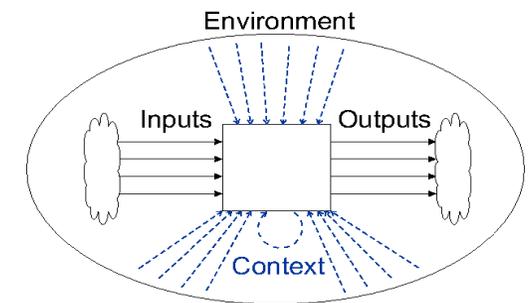
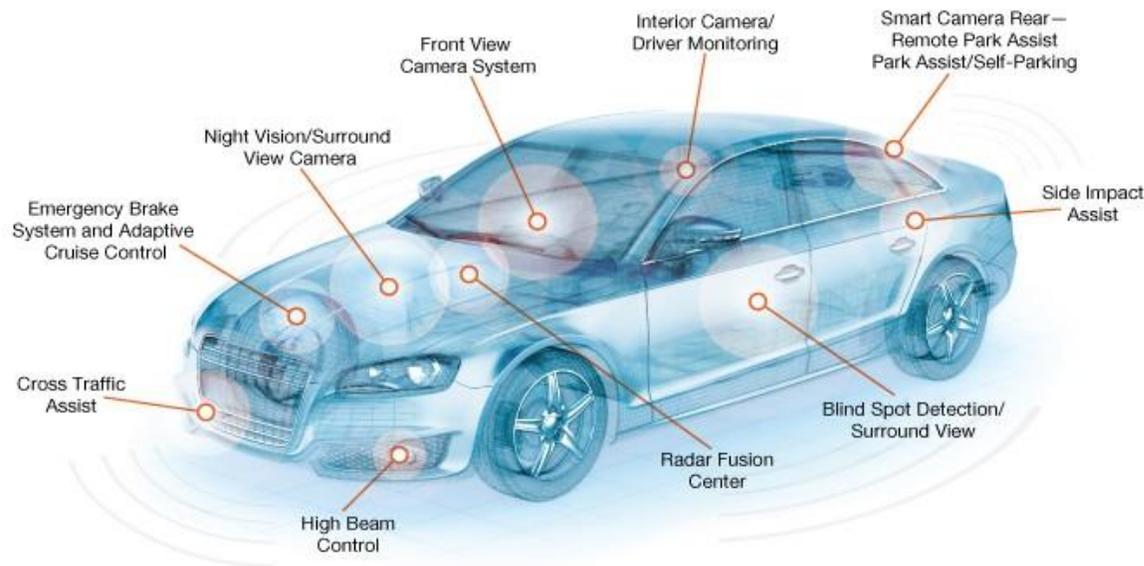
- ✓ Trajectory Analysis in Autonomous Driving
- ✓ Identification of Driver Behavior Characteristics
- ✓ Real-Time Activity Prediction
- ✓ Image Processing (In-Car Cameras)
- ✓ Personalized Situation-Adaptive User Interaction in the Car
- ✓ Data Collection Process
- ✓ Voice Dialogue Systems for Hands-Free Interaction
- ✓ etc.



e.g. Advanced Driver Assistance System Applications

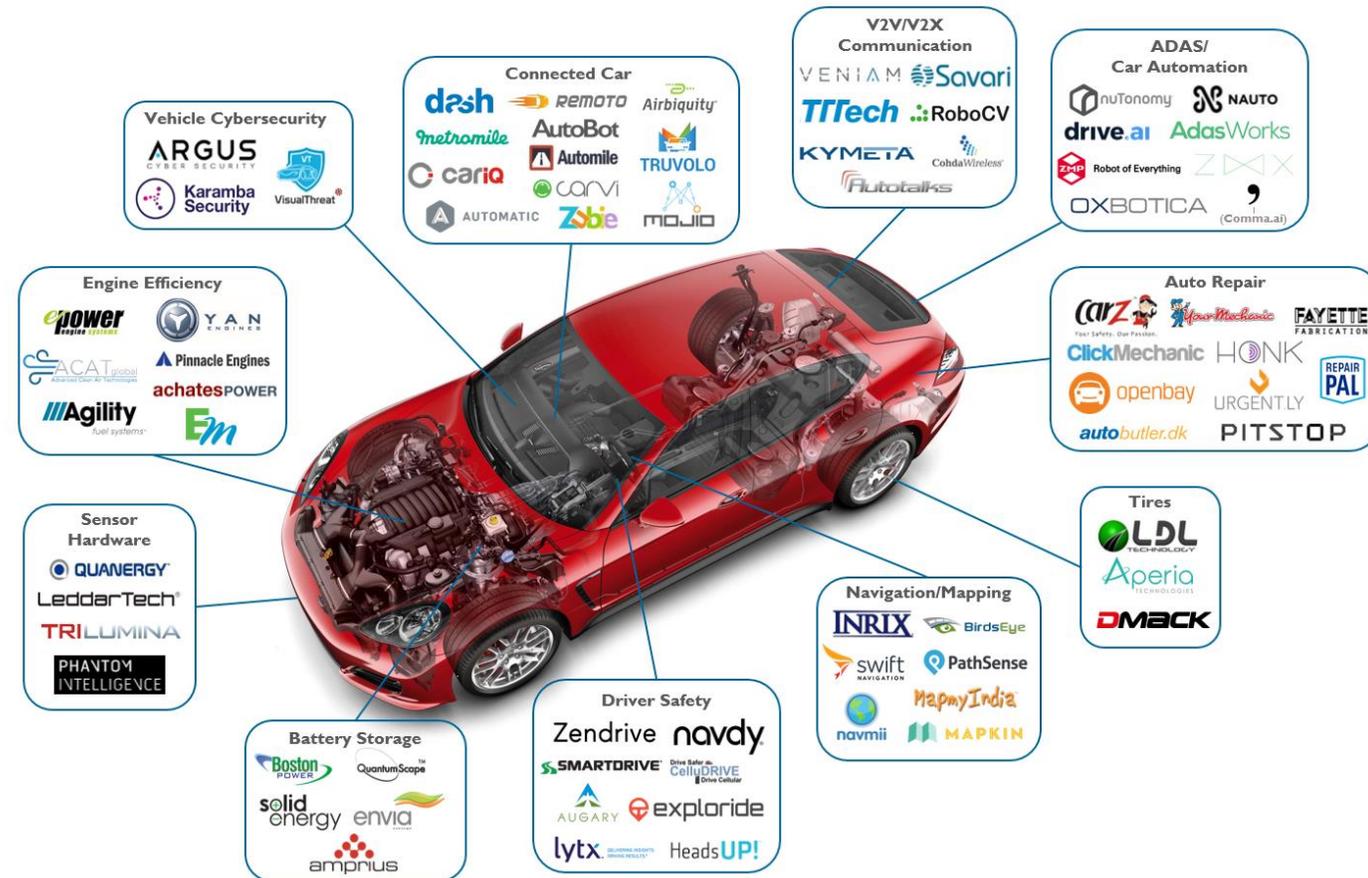
➤ Each Intelligent Component Needs:

- ✓ **Right Data**
- ✓ **Right Time**



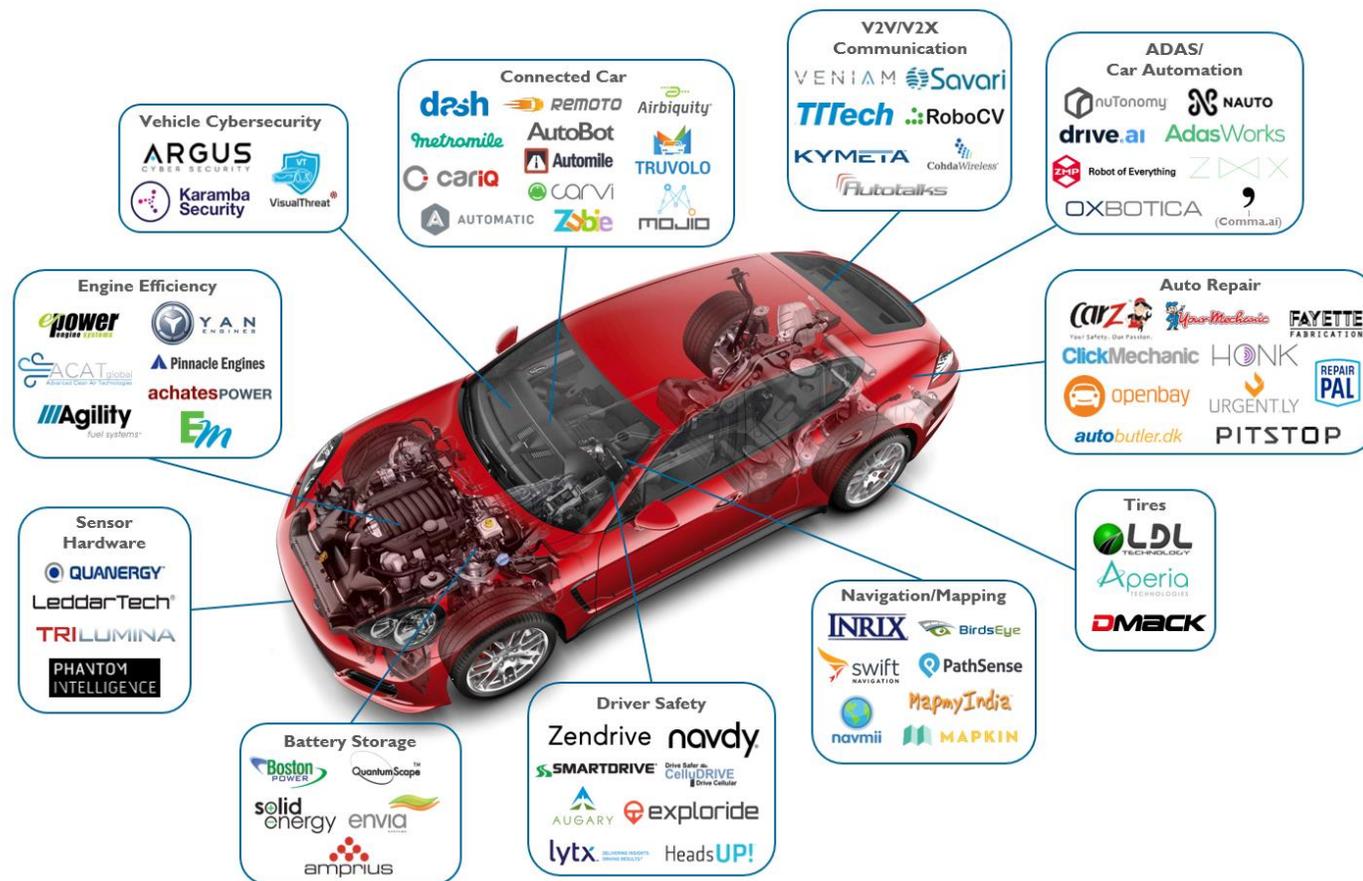
Context Prediction Use Cases in Autonomous Car

- Inferences on Intelligent Components' Future Context
- Increasing the Comfort Level of the Occupants
- Planning Passengers' Wellbeing
- Early Coordination of Individuals
- Power Management of the ECUs and Components
- Early Warning of Possible Dangers / Problems



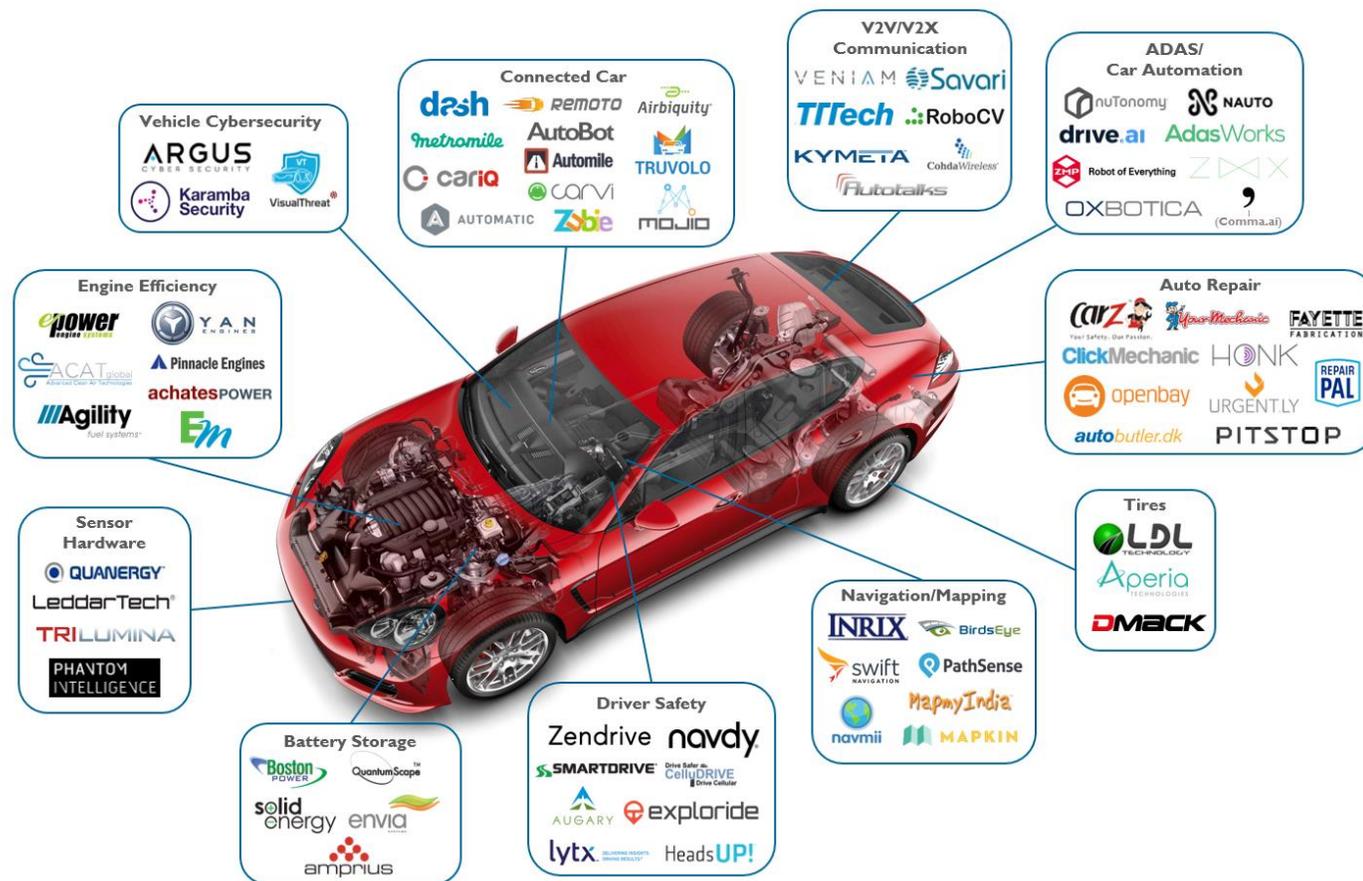
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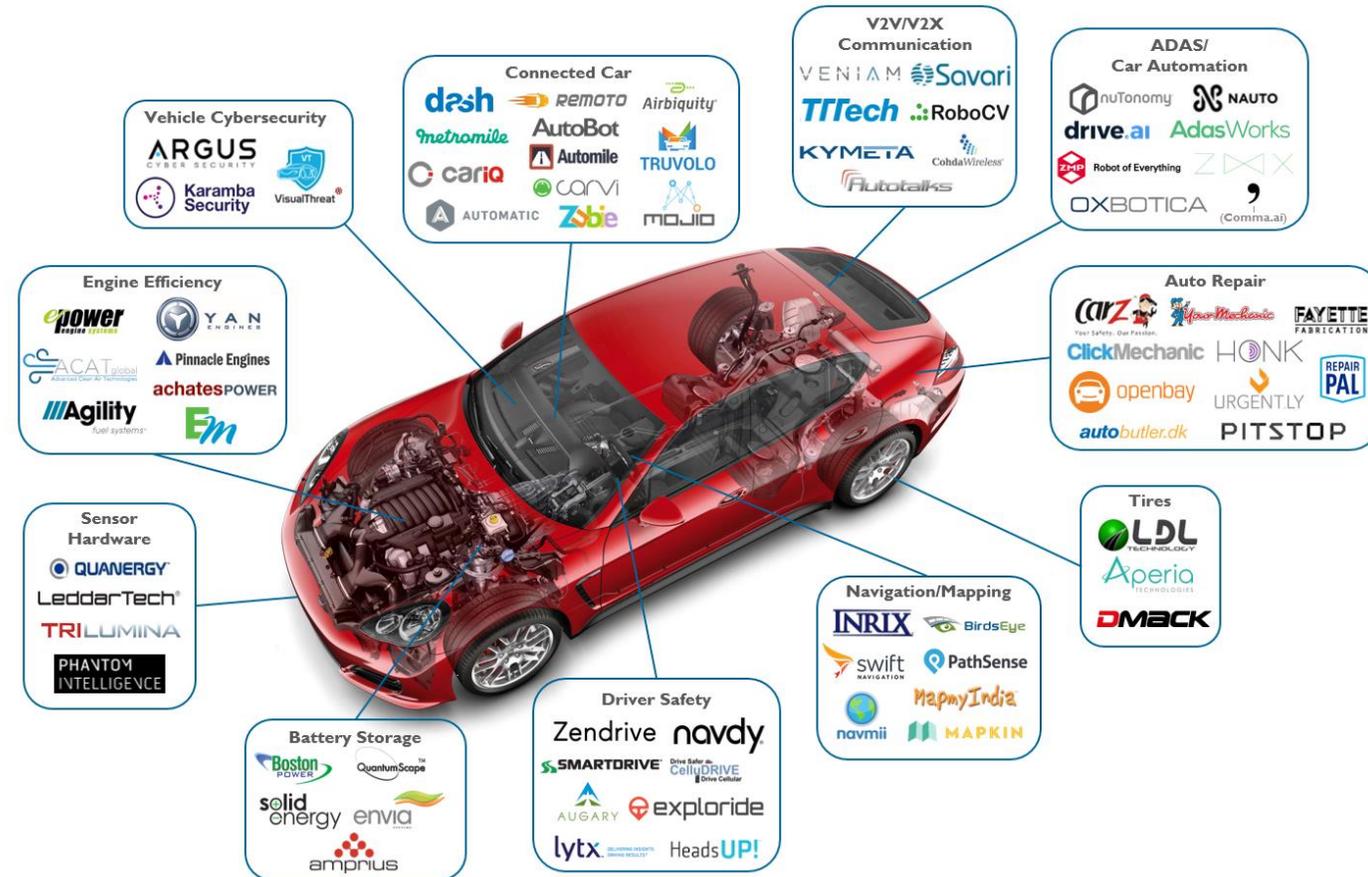
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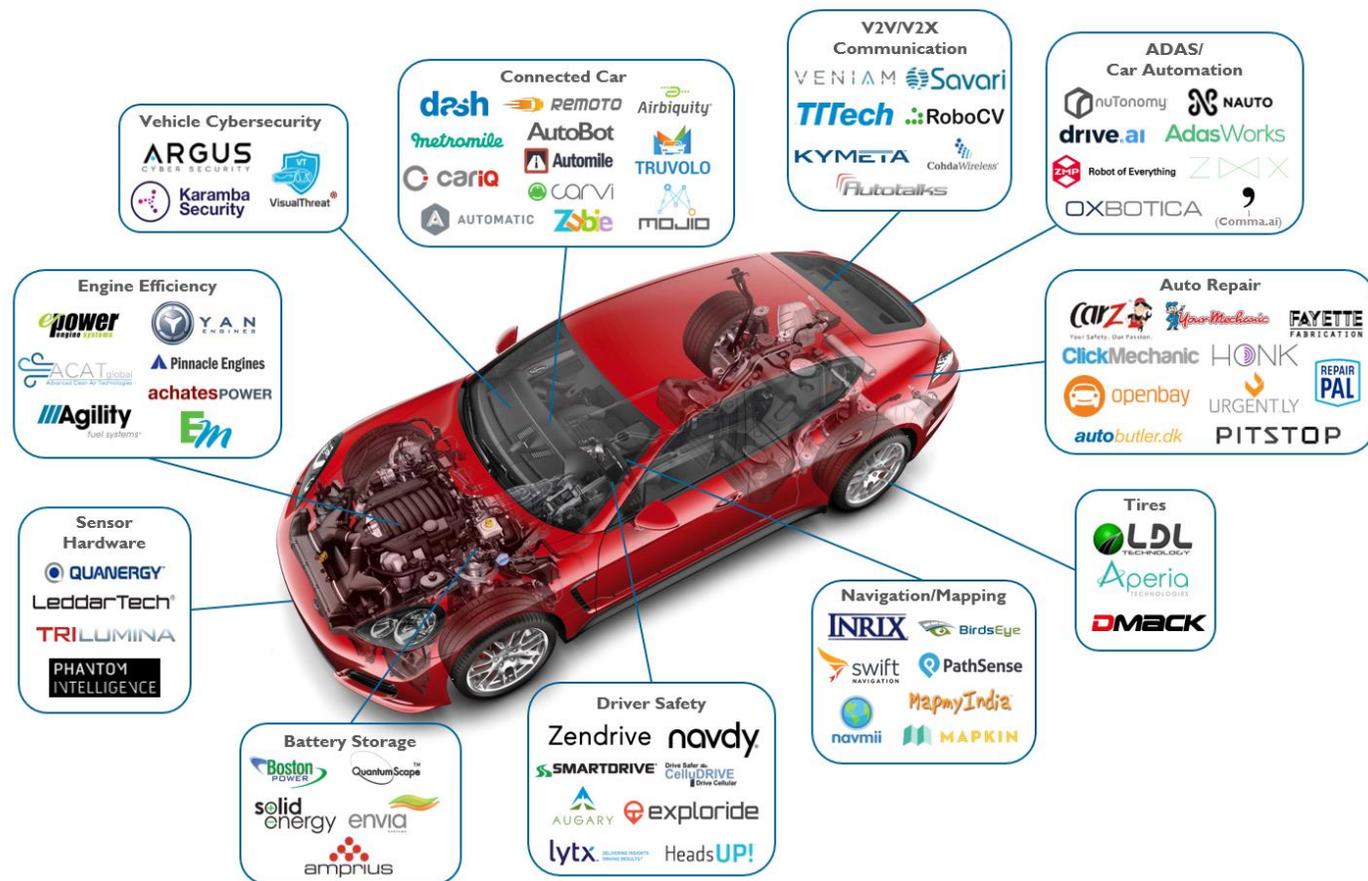
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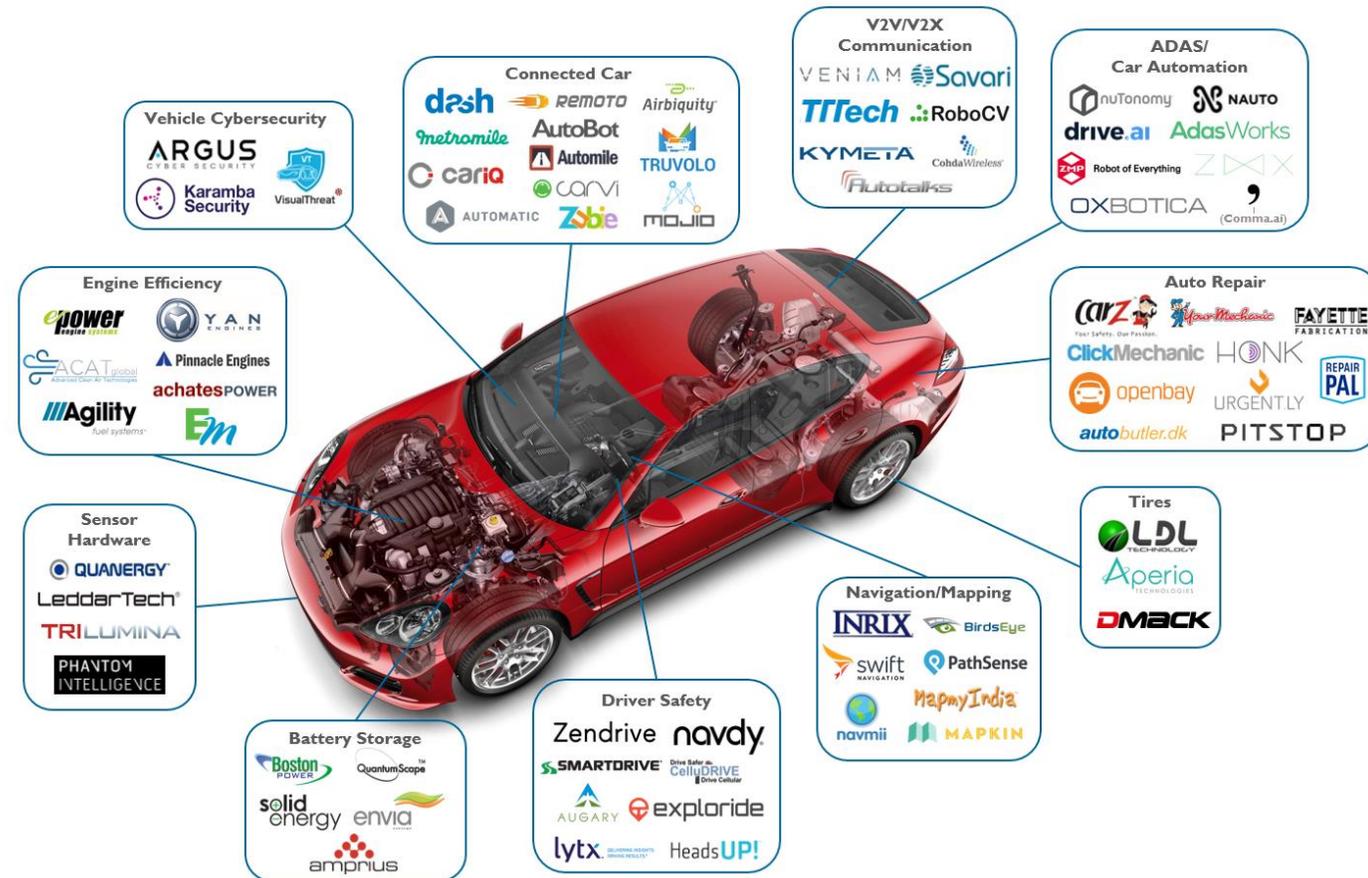
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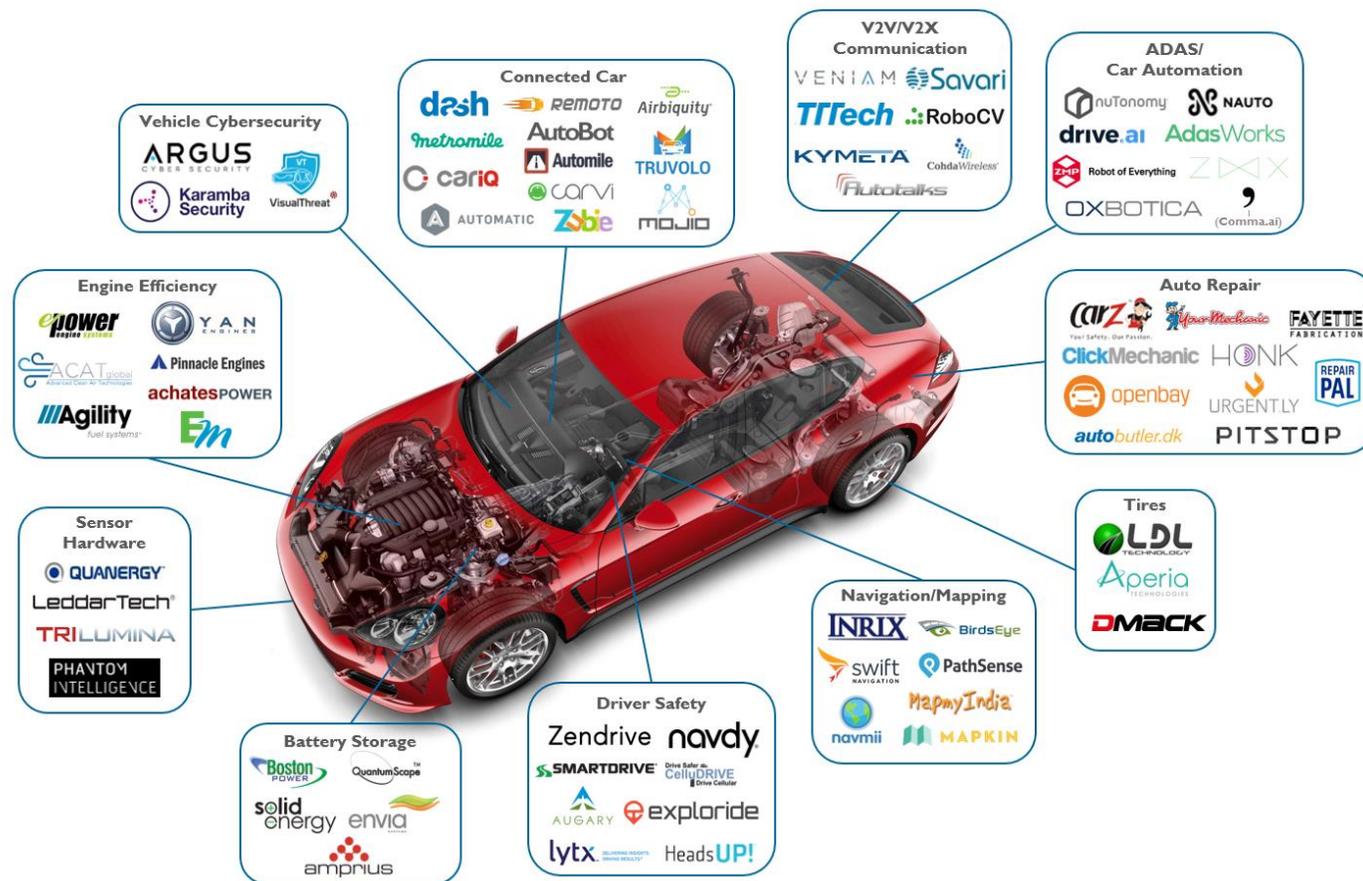
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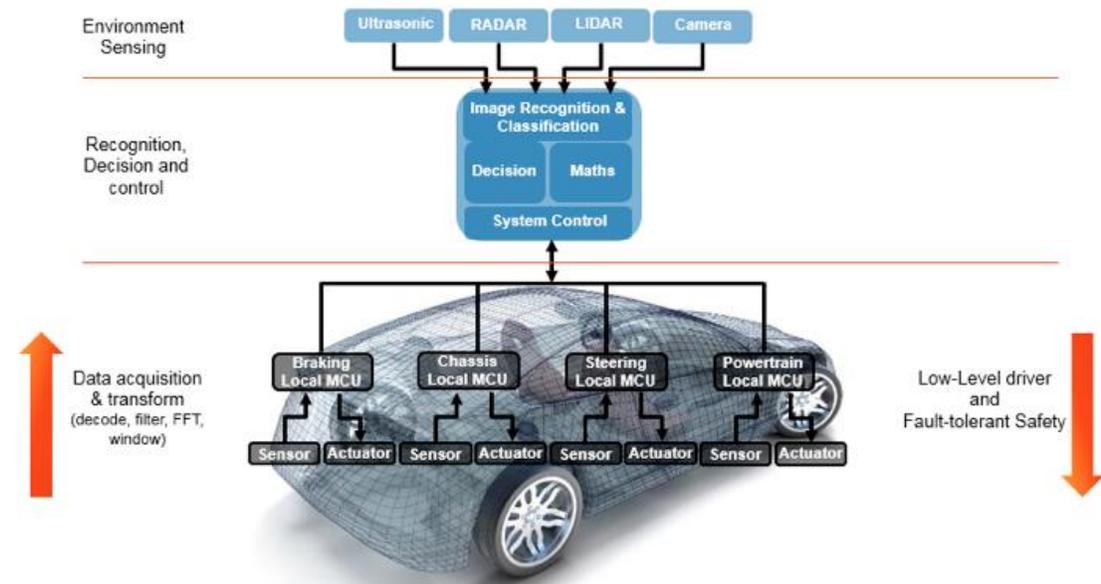
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Challenges in a Car

- Systems Work in Real Time
- Difficulty in Predicting Human Actions
- Data in Discrete Time (Continues Time?)
- High Heterogeneity of Data
- Limited Hardware Capabilities
- Minimum Learning Phase
- Lack of Suitable Automated Decision Making



Context Prediction in Autonomous Driving Seminar

Structure

Objectives

- Focus Will Be on the State-of-the-Art
- How to Read Scientific Publications
- How to Write a Scientific Paper
- How to Revise a Scientific Work
- How to Present a Scientific Work

Getting Familiar with the Context Prediction Domain in Autonomous Driving

Topics

- **A-** Challenges in Designing a Context Prediction Architecture
- **B-** Context Prediction and Service Oriented Architecture
- **C-** Driver Behavior Modelling For Context Prediction
- **D-** Challenges of Deploying Neural Nets for Context Prediction in Fully Automated Driving
- **E-** Neural Networks and Deep Learning in Context Prediction
- **F-** Context Prediction and Reinforcement Learning
- **G-** Approaches for Optimizing the Accuracy of the Prediction Results
- **H-** Limitations of Deep Learning Methods in Context Prediction
- **I-** Trajectory Prolongation Approach (Interpolation/Approximation)
- **J-** Ambient Intelligent Systems
- **K-** Space Theory in Context Prediction
- **L-** Enabling Proactiveness through Context Prediction

Procedure

1. Find a Partner and Choose one/two Topic(s)
2. You Will Get a Notification Email Regarding Your Assigned Topic
3. Extract the Related Papers and Resources to Your Topic
4. Each Group Needs to Review **at Least 3 Scientific Work**
5. Initial Meeting in My Office to Discuss the Collected Materials and Expected Results
6. Write a Seminar Paper on Your Work and Submit the First Draft
7. Present Your Work at the Specified Time Slot / Date
8. Submit the Final Version of Your Paper
9. Write a Review on the Assigned Paper (Another Group's Work)
10. Submit Your Review by the Specified Deadlines

Information about the Seminar

- Time and Location: 02.09.023 / 15:00-17:00
- Check the Webpage of the Seminar Regularly
- Presentation Dates are Available at TUMOnline and the Webpage of the Course

000003282 17W 2SWS SE Masterseminar - Context Prediction in Autonomous Driving (IN2107) Hilfe 🏠

Lehrveranstaltung - Detailsicht

Sprache
Deutsch **Englisch**

Gehe zu
[weitere Info](#) [LV-Anmeldung](#) [gleiche LV](#)

Allgemeine Angaben

Titel	Masterseminar - Context Prediction in Autonomous Driving (IN2107)
Nummer	000003282
Art	Seminar
Semesterwochenstunden	2
Angeboten im Semester	Wintersemester 2017/18
Vortragende/r (Mitwirkende/r)	Knoll, Alois Christian [L], Shafaei, Sina
Organisation	Informatik 6 - Lehrstuhl für Echtzeitsysteme und Robotik (Prof. Knoll) (Kontakt)
Stellung im Studienplan / ECTS-Credits	Details

Angaben zur Abhaltung

Inhalt	
Inhaltliche Voraussetzungen (erwartete Kenntnisse)	keine
Ziel (erwartete Lernergebnisse und	

<https://campus.tum.de>

Informatics 6 - Chair of Robotics and Embedded Systems
TUM Department of Informatics
Technical University of Munich

TUM

Home > Teaching > Winter Semester 17/18 > Seminar "Context Prediction in Autonomous Driving"

Seminar "Context Prediction in Autonomous Driving"

Organizer: M.Sc. [Sina Shafaei](#)

Modul: IN2107

Type: MasterSeminar

Semester: WS 2017/2018

ECTS: 4.0

SWS: 2

Time & Location: [02.09.023](#) / 15:00-17:00

News

- **The first session of the seminar (details, topic assignments, team members) will be on 20.10.2017 at [02.09.023](#) / 15:00-17:00**
- The preliminary talk took place on 12th of July 2017, 13:00-14:00 at [02.09.023](#) on the second floor. Slides

Informatik VI - Lehrstuhl für Echtzeitsysteme und Robotik

Prof. Dr.-Ing. habil. Alois Christian Knoll

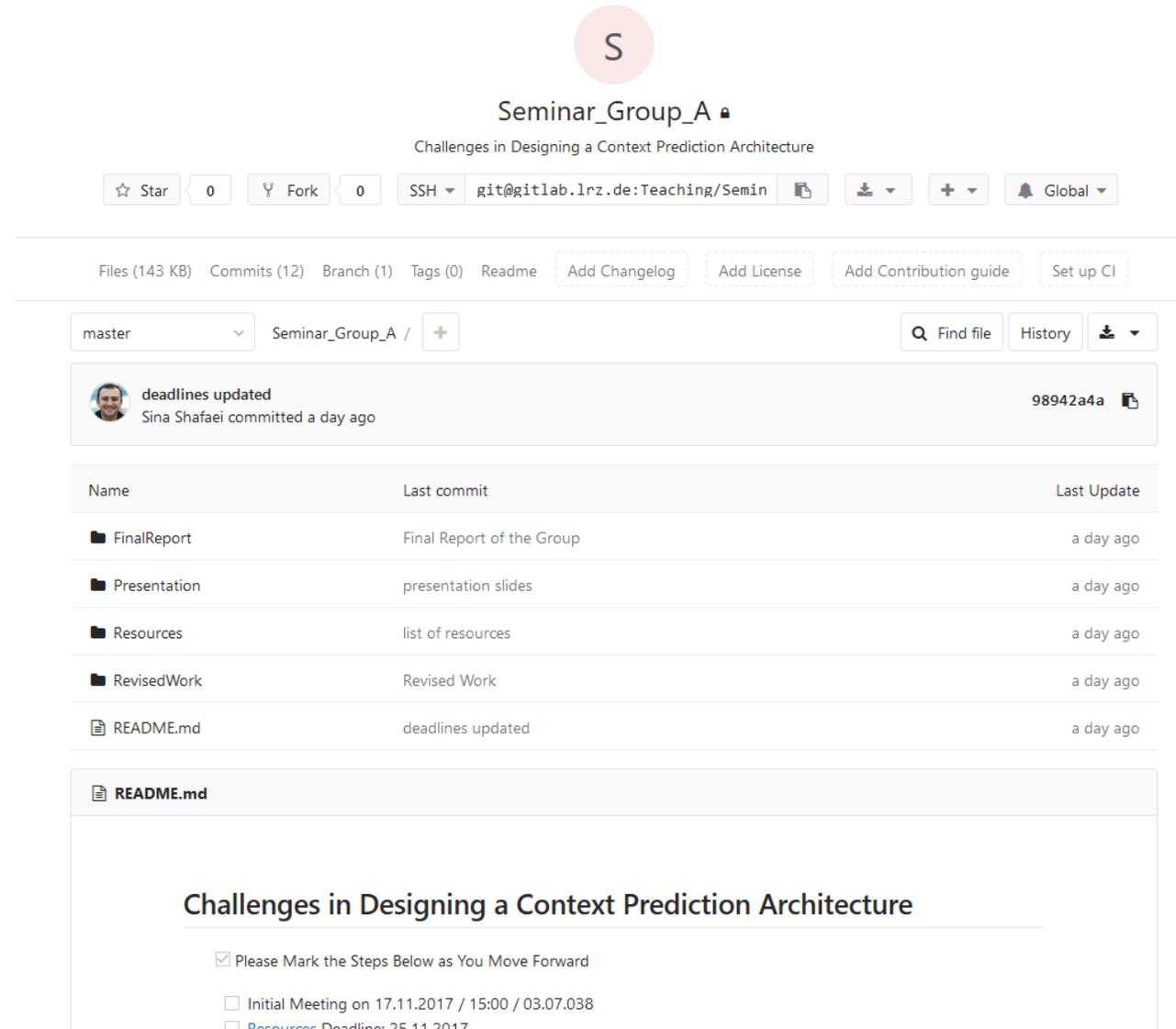
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Fax.: +49.89.289.18107

<http://www6.in.tum.de/en/teaching/winter-semester-1718/seminar-context-prediction-in-autonomous-driving/>

Gitlab Repository

- Each Group Will be Granted Access to the Their Own Repository
- There Will be an Initial Meeting for Each Group Regarding Their Topic (Date+Time is over Gitlab)
- Update Your Repository with Your Work (All of the Submissions)
- Your Access is Limited until the End of Final Deadline
- Please Fill the Form with Your Name, Email Address and TUMID e.g. “ga35sep” + sina.shafaei@tum.de
- There is a Good Documentation for Gitlab [Here](#), Just in Case



Seminar_Group_A

Challenges in Designing a Context Prediction Architecture

Star 0 Fork 0 SSH git@gitlab.lrz.de:Teaching/Semin

Files (143 KB) Commits (12) Branch (1) Tags (0) Readme Add Changelog Add License Add Contribution guide Set up CI

master Seminar_Group_A / Find file History

deadlines updated
Sina Shafaei committed a day ago 98942a4a

Name	Last commit	Last Update
FinalReport	Final Report of the Group	a day ago
Presentation	presentation slides	a day ago
Resources	list of resources	a day ago
RevisedWork	Revised Work	a day ago
README.md	deadlines updated	a day ago

README.md

Challenges in Designing a Context Prediction Architecture

- Please Mark the Steps Below as You Move Forward
- Initial Meeting on 17.11.2017 / 15:00 / 03.07.038
- Resources Deadline: 25.11.2017

Important Dates

- Initial Meetings, Specified in Each Groups' Repository (**17.11.2017** / **24.11.2017**)
- Collecting Resources and Literature Review, Specified in Each Groups' Repository (**25.11.2017** / **27.11.2017**)
- Presentation Slides (**24 Hours Before the Presentation**, e.g. presentation: 12.01 @15:00 → slides must be in repo by: 11.01 @15:00)
- Final Report (1 Week After the Presentation, presentation: 12.01 @15:00 → final report must be in repo: 19.01 @23:59)
- Revision Work Assignment (**10.02.2018**)
- Submitting the Reviews (**17.02.2018**)
- Grading (**10.03.2018**)
- Discussion about the Grades (**30.03.2018**)

Grading

- Extracting the Related State-of-the-Art Resources (20%)
- Writing an Acceptable Seminar Paper (40%)
- Revising and Writing a Review (10%)
- Presentation of the Work (30%)

Attendance to the Presentation Sessions is **Mandatory**

Notes on Plagiarism

- Avoid Explicit Copy & Paste!
- Cite **any** Scientific Idea or Concept You Use!

What if ...?

- Seminar Grade = 5.0
- The Responsible Department at TUM Will Initial the Investigation Officially



General Information and Resources (Hyperlinks)

- [IEEE latex template](#) for Writing Scientific Papers
- [Latex Editor](#) For the Final Report
- A Good Reference on [How to Write a Scientific Paper](#)
- You Presentation [Must not be Like This!](#)
- A Useful Tool to [Manage Your References](#) and Citations

Appendix

Important Notes in Writing a Scientific Paper

How to Write a Scientific Paper?

Overall Paper Organization:

- Title
- Abstract
- Introduction
- Literature Review (Can be integrated into Introduction)
- Methodology
- Results
- Discussion
- Conclusion

The Paper Title

- Says precisely what the paper is about
- Is short
- Does not have multiple sub-clauses

The Abstract

- The most important part of your paper
- When a reviewer reads your paper they form an image of what it is about from the title and the abstract
- The reviewer uses this impression to interpret the rest of the information in the paper
- Gets your paper cited by others

What Should Be in an Abstract?

- Establish the topic of the research
- State the research problem or main objective of paper
- Indicate the methods used
- Present the main research findings
- Present the paper's conclusion

The Introduction

- To situate the research in its research field
- To document why the research being presented is important
- To state the research problem the paper will solve
- To present the steps that will be taken to solve the problem

What Should Be in an Introduction?

- Context / background for the research
- Rationale for conducting the research
- A description of the problem being solved
- The steps the researcher will take to solve the problem

What an Introduction May Contain?

- The scope of the problem (what the research will not address)
- The limitations of the research
- The methods, models, approaches that will be taken in the research (assumptions)

Literature Review

- To evaluate prior work that has been done in your paper's research area
- To set the context for your research

Questions That a Literature Review Covers

- What do we already know in the immediate area concerned?
- What are the characteristics of the key concepts or the main factors or variables?
- What are the relationships between these key concepts, factors or variables?
- What are the existing theories?
- Where are the inconsistencies or other shortcomings in our knowledge and understanding?
- What views need to be (further) tested?
- What evidence is lacking, inconclusive, contradictory or too limited?
- Why study (further) the research problem?
- What contribution can the present study be expected to make?
- What research designs or methods seem unsatisfactory and why?

Suggestions for Writing a Literature Review

- Collect your references
- Put your references in appropriate format
- Write a research argument for your work
- Cut and paste references in their appropriate places in the research argument
- Write review

Methodology

- Allow the reader to judge whether the appropriate research was done to arrive at the paper's conclusion
- Methods section answers two questions:
 - ✓ How the data was collected or generated
 - ✓ How the data was analyzed

- Method used affects results
- There are often multiple methods to choose from
- The reader wants to judge whether the method carried out is consistent with accepted practices
- The reader wants to judge whether the research methods the goals of the research study
- The methods section describes problems that were anticipated in the study so that the reader is assured that the research was done correctly

Results

- The results from the research methods used with an emphasis on visualization techniques (graphs, tables, diagrams) for comprehending the results
- Explanatory text explaining all the visualization pointing out the most important results ...and failures
- Two basic ways of organizing the results:
 - ✓ Presenting all the results, then giving a discussion, usually in a different section
 - ✓ Presenting a result then a discussion, then a result then a discussion

Discussion

- Often the results require detailed explanation because they were not what was expected
- Results may require interpretation to be understood
- Results may be embedded in a larger body of work which needs to be referenced and discussed
- A more general research conclusion may be possible from the collection of results

What is Found in a Discussion Section?

- Explanation of results
- Comparison of results to previous research
- Deduction from the results
- Hypotheses – more general claims or conclusions suggested by the results but which require further testing

The discussion section does not point out the significance of the findings

The discussion section does not even discuss the findings

Conclusion

- The conclusion gives a summary of:
 - ✓ What was learned (usually first)
 - ✓ What remains to be learned (directions for future research)
 - ✓ The shortcomings of the work (evaluation)
 - ✓ The benefits of the work (contributions)
 - ✓ Recommendations

Reference of the Appendix

Notes are taking from the great presentation and slides of **Marilyn Tremaine**