Advance Methods for Emotion Recognition in highly Automated Driving

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Current Status of Automated Driving

Learn more about SAE J3016 or purchase the standard document:
www.sae.org/autodrive
Question…

Why Do We Need Emotion Recognition Systems in (semi-)Autonomous Cars?
Current Status of Automated Driving

Benefits of Emotional Awareness?

Learn more about SAE J3016 or purchase the standard document: www.sae.org/autodrive
Topics of This Seminar

A- Illumination Resisted Approaches for Emotion Recognition Systems
B- Driver Behavior Modeling and Fusion Approaches for Emotion Recognition Systems
C- Thermal Imaging and Emotion Classification for In-Cabin Environment
D- Eye Gaze Modeling of Driver and Passengers (level 3, 4 and 5) for Emotion Recognition Systems
E- Emotion Classification using LSTM Based on Driving Behavior
F- Emotion Classification Using CNN Based on Driving Behavior
G- Recurrent Neural Network Architectures for Emotion Classification in Multimodal Emotion Recognition Systems
H- Maintaining Prediction Robustness of the Multimodal Emotion Recognition Systems
I- Scaling the Mutimodal Emotion Recognition Models into an Embedded Device
Information about the Seminar

• Time and Location: **02.09.023 / 13:00-15:00**

• Check the Webpage of the Seminar Regularly

• Presentation Dates are Available at TUMOnline and the Webpage of the Course

[Link to Seminar Webpage](https://campus.tum.de)
[Link to Seminar Details](https://www6.in.tum.de/teaching/ss-19/seminar-advanced-methods-for-emotion-recognition-in-highly-automated-driving/)
Procedure

1. Find a Partner, Choose one/two Topic(s), and Fill the Form
2. You Will Get a Notification Email Regarding Your Assigned Topic
3. Extract the State-of-the-Art Papers and Resources to Your Topic
5. Summarize the Selected Works in One Page (Template is in Your Gitlab Repo)
6. Initial Meeting in My Office to Discuss the Collected Materials and Expected Results
7. Write a Seminar Paper on Your Work and Findings
8. Present Your Work at the Specified Time Slot / Date
9. Demonstrate Your Findings (Live on RPI or Car Simulator)
10. Submit the Final Version of Your Paper
Gitlab Repository

• Each Group Will be Granted Access to their Own Repository
• There Will be an Initial Meeting for Each Group Regarding Their Topic (Date+Time is Available in Gitlab Repos)
• Update Your Repository Regularly with Your Work (Submissions)
• Your Access is Limited until the Final Deadline
• After the Deadlines, no Submission Will be Accepted
• 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
Important Dates

- Initial Meetings, Specified in Each Groups’ Repository (10.05.2019)
- Collecting Resources and Literature Review (31.05.2019)
- Presentation Slides (48 Hours Before the Presentation, e.g. presentation: 28.06 @13:00 → slides must be in repo by: 26.06 @13:00)
- Final Report (1 Week After the Presentation, e.g. presentation: 28.06 @13:00 → final report must be in repo: 05.07 @23:59)
- Demonstration (On the day of Presentation)
- Grading (20.08.2019)
Grading

• Extracting the Related State-of-the-Art Resources (10%)
• Writing a High Quality Scientific Paper (30%)
• Demonstrating the Findings (30%)
• Presenting the Work (30%)

• Attendance to the Presentation Sessions is Mandatory
Notes on Plagiarism

• Avoid any Kind of Copy & Paste!
• Cite **ALL** of the Scientific Works, Ideas and the Concepts 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
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 of the Appendix are taken from the presentation and slides of Marilyn Tremaine