



Confirmability and reproducibility of scientific insights and artefacts

From coding to results (a management summary)

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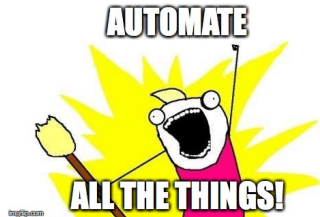
Motivation – Problem Statement

- In publications, academic research often only applies *confirmability*, *transparency* and *reproducibility* to (formal) models and analysis.
- Typical workflow to answer research questions:
modelling → coding → simulating → analysing → more coding ...
- A correct model does not imply a correct, i.e. error-free implementation
⇒ correctness of simulation results? ⇒ correctness of model?
- Often no implementation referenced in paper (→ *transparency*)
⇒ how to assess correctness and ensure reproducibility without?
- DFG guidelines [1, 2] state that members of their funded projects have to document and publish research data for useful reuse (raw or structured data) and make it available for at least 10 years.
- DFG documents¹ mentioning source code, e.g. [3, 4] clearly advocate disclosure and publication of source code.

¹http://www.dfg.de/service/suche_de/index.jsp?q=quellcode

Motivation – Our goals

- We propose a workshop to answer questions like
 - How to ensure high code quality, reproducibility, correctness?
 - How and where can we publish our code and data?
 - How to cite code and data used in publication?
- Individually help PhD candidates choosing the right technology related to [Problem Statement]
- Provide PhD candidates with necessary workflows
- PhD candidates should focus on research
⇒ automate as much as possible
 - documentation
 - code quality and correctnessto make life (i.e. research) easier



Useful platforms and tools

In the workshop, we would introduce the following platforms and tools

1. Source code repository and documentation (\rightarrow *transparency*)
 - **GitHub** and SocialCars GitHub site github.com/SocialCars
 - **Hugo** to build static sites with markdown
2. Testing and automation of task (\rightarrow *correctness* and *reproducibility*)
 - **Coveralls** and **Codecov** (check whether your code is tested, i.e. correct)
 - **FindBugs** (checks for common errors in Java code)
 - **Circle CI**, **Travis CI** (automate repetitive tasks)
3. Publication of citable code and data (\rightarrow *long-term availability*)
 - **Zenodo** (assigns DOIs to datasets and code)

GitHub: Source code repository and documentation

- We propose GitHub to host code in a DFG-compliant manner
- For documentation purposes websites can be hosted, i.e. socialcars.github.io
- Documentation of models and implementation (→ see DFG requirements)
- Individual presentation of each PhD candidate's work
- Content written in markdown syntax
- Automatic deployment via CircleCI

Cooperative (de-)centralized traffic management
DFG Research Training Group 1931
SocialCars

HOME RESEARCH FIELD A RESEARCH FIELD B RESEARCH FIELD C INTERDISCIPLINARY RESEARCH

B2.1 Malte Aschermann: A mechanism for automatic coordination of cooperative driving manoeuvres: Fairness vs. Efficiency

vehicles send request for clearance, (preferences, capabilities) → Coordination Service Entity → schedule vehicles for each vehicle → send statistics → SUMO: driver set (efficiency, system efficiency, fairness, fairness)

policy-compliant re-ordering of vehicles

Figure: Coordination of vehicles by means of policies

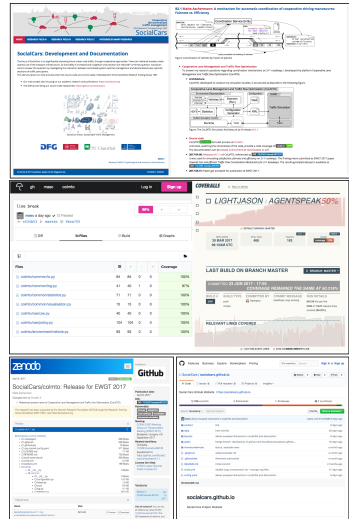
- **Cooperative Lane Management and Traffic flow Optimisation**
To answer my research questions regarding coordination mechanisms on 2+1 roadways, I developed the platform Cooperative Lane Management and Traffic flow Optimisation (CoLMTO):
 - **Architecture**
CoLMTO, developed to conduct my simulation studies, is structured as depicted in the following figure.

CoLMTO Simulation Architecture as of release v0.1.1

- **Source code**
CoLMTO [Github](#) the build process at [CircleCI](#).
Unit tests, asserting the correctness of the code, provide a code coverage of [codecov](#) **100%**.
The documentation can be [viewed online \(html\)](#) or [downloaded as pdf](#).
- **2017-04-06:** Released v0.1.1 of CoLMTO, referenced as [10.5281/zenodo.13111](#)
It was used for simulating satisfaction, fairness and efficiency on 2+1 roadways. The findings were submitted as EWGT 2017 paper Towards Fair and Efficient Traffic-Flow Coordination Mechanisms for 2+1 Roadways. The resulting/related dataset is available as [DOI: 10.5281/zenodo.491742](#)
- **2017-05-31:** Paper got accepted for publication at EWGT 2017.

Thank you for your attention





- For further discussion and questions we would offer a workshop to individually help each PhD candidate on this topic.



The collage displays four screenshots related to the SocialCars project:

- Top Left:** The SocialCars website, featuring a network diagram and the text "SocialCars Development and Documentation". Logos for DFG and Clausthal are visible at the bottom.
- Top Right:** A screenshot of a code coverage report titled "COVERAGES". It shows a bar chart for "LIGHT/JASON - AGENTSPEAK" with a 50% coverage rate. Below the chart is a table with columns for "FILE", "COVERAGE", and "STATUS".
- Bottom Left:** A screenshot of a Zenodo release page for "SocialCars: Release for EWGT 2017". It lists various files and their sizes.
- Bottom Right:** A screenshot of a GitHub repository page for "socialcars/socialcars". It shows the repository name, description, and a list of files.

References

-  [1] Leitlinien zum Umgang mit Forschungsdaten, 2015.
http://www.dfg.de/download/pdf/foerderung/antragstellung/forschungsdaten/richtlinien_forschungsdaten.pdf.
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-  [3] Basisinformationen zum Forschungsdatenmanagement, 2016.
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-  [4] Merkblatt Informationsinfrastrukturen für Forschungsdaten, 2016.
http://www.dfg.de/formulare/12_14/12_14_de.pdf für Wissenschaftlichen Literaturversorgungs- und Informationssysteme.