

**Paper title:** Two Ethical Requirements for the Social Acceptance of Intelligent Vehicle Applications

**Author:** Martin Aleksandrov (presenter)

**Organization:** Freie Universität Berlin

**Address:** Arnimallee 7, 14195 Berlin, Germany

**E-Mail:** [martin.aleksandrov@fu-berlin.de](mailto:martin.aleksandrov@fu-berlin.de)

**Topic:** Fleet Management, Driver Fairness, Customer Optimality

**Abstract:** On a conceptual level, we propose an innovative research intersection of four domains: Vehicle Routing Problems, Computational Social Choice (COMSOC), Constraint Satisfaction Problems (CSPs), and Geographic Information Systems (GIS). We refer to it as Social Vehicle Routing Problems (SVRPs). SVRPs are multidisciplinary in nature. COMSOC problems can be from fair division, voting theory, or judgment aggregation. CSPs can be from scheduling, loading, or searching domains. GIS problems can be from navigation, mapping, or sensing domains.

On a practical level, we align our research with the public mobility Transport Policy Flagships of the EU Strategy for Sustainable and Smart Mobility, according to which the transition to future personal mobility must involve the preferences of individuals. Our research further aligns with the goals for Trustworthy Mobility of the German Ministry for Traffic and Digital Infrastructure, the German Ethics Commission for Automated and Connected Driving, and the European Institute of Innovation and Technology in Hungary.

On a technical level, we propose new algorithms for SVRPs, which first return a feasible matching between drivers and customers and then a minimal plan for routing the vehicles through their matched locations. In semi-informed settings, we give matching algorithms for achieving subject fairness for drivers (i.e. FEF1, FEFX), objective fairness for drivers (i.e. FEQX), and efficiency for drivers (i.e. FSWmax), as well as fairness and efficiency for customers (i.e. FSWmin). We also give fixed-parameter tractable routing algorithms for fleet fairness (i.e. maxTRAVEL) and fleet efficiency (i.e. totTRAVEL).

Finally, we are currently evaluating our algorithms in the lab. In the future, we will also evaluate them in the real world as part of the Smart City Mobility Bamberg project (<https://smartcity.bamberg.de/>), whose main goal is to promote the use of autonomous public transportation stops among society members who live further from the existing stops. Thus, we expect that fairness and efficiency can be useful for achieving this goal, also because they are identified by the European Commission as two of the critical ethical requirements for the social acceptance of future mobility.