

BUT-FEEC, Department of Radio Electronics

Master's Thesis

SPATIAL FUNCTION ESTIMATION WITH UNCERTAIN SENSOR LOCATIONS

by Bc. Martin Ptáček

Supervisor's evaluation

This evaluation report was written by the supervisor on the TU Wien side, Franz Hlawatsch. (The thesis was carried out within the Joint Master Degree Program in Telecommunications offered by TU Brno and TU Wien.) The subject of the thesis is a theoretical analysis and simulation study of Gaussian Process Regression (GPR) with uncertain training locations within the Bayesian framework, based on existing literature. GPR with uncertain training locations is of great practical relevance in many applications, including mobile communications, but theoretically challenging as it involves nonlinear and non-Gaussian relations. Closed-form results can be obtained only under some more or less questionable approximations and simplifying assumptions. Moreover, the available literature is generally not easy to understand.

The thesis presents and critically evaluates some of the main approaches that have been proposed in the literature. Further major contributions include a numerical implementation of the discussed GPR methods using Monte Carlo techniques, and an experimental assessment and comparison of the performance of the different approaches. The thesis also contains several new results, including a rigorous statement of the approximations underlying a previously proposed closed-form GPR method and an experimental performance comparison of two GPR methods that has not been published so far.

The thesis is well organized and clearly written in very good English and with a consistent mathematical notation. The presentation is theoretically sound, complete, coherent, and easy to follow. It provides many details, intermediate steps, and explanations that are missing in the literature but are required to understand the theory. The mathematical/technical analysis is carried out at a high level and complemented by insightful discussions and interpretations. The relevant literature is cited and duly taken into account.

In summary, the thesis is a valuable contribution to the field that is both theoretically significant and practically useful. It is the result of intense work of the student during many months, with regular meetings with his supervisors on the TU Brno and TU Wien sides. Personally, I am impressed by the student's level of achievement and scientific output in spite of stringent time limitations. **I recommend the thesis for defense and evaluate it with 98 points.**