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Title: «*Multi-process Dynamic Linear modeling for tumor growth evolution*»

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Abstract: The mathematical modeling of tumor growth and progression has been thoroughly studied and many such models exist in the literature. The majority of these modeling techniques are formulated in a deterministic context, thus lacking any information regarding the uncertainty of the predicted future state of the tumor size. Many are theoretically well defined and can have useful practical applications; for example such models can be used to define general optimal treatment protocols through onstrained optimization. However, modern healthcare is continuously becoming less general and more personalized. In this paper we propose a sequential probabilistic mixture model for individualized tumor growth forecasting. The model uses prior information from the general population and becomes more individualized as more observations from the subject are sequentially taken into account by the model. In our extensive simulation study we illustrated the superiority, under uncertainty, of the suggested multi-process dynamic linear model against the single process alternative. The validation of our model was performed with experimental data from mice and the results show that after few observations from a tumor are obtained and included in the model, the latter becomes both more individualized, in the sense that it adjusts its parameters in order to explain the growth of each individual tumor and much more e cient ffi in terms of precision regarding the prediction of the tumor size.

Biography: Dr Achilleas Achilleos completed his undergraduate degree in Mathematics, Operational Research, Statistics and Economics (M.O.R.S.E.) at the Department of Mathematics at the University of Warwick in 2006. He then earned a full scholarship to study an MSc in Statistical Science in the London School of Economic and Political Science. In 2007, Achilleas joined the Department of Mathematics at the University of Bristol for a PhD in Applied Statistics. He completed his PhD in 2011. He is currently working in the Research Center for Intelligent Systems and Networks (K.I.O.S.) at the University of Cyprus for a project concerning mathematical modeling of cancer progression and development of therapy strategies with model-based control methods. Among his major research interests are smoothing parameter selection for kernel density and regression estimation in the presence of measurement error, linear dynamic modeling with Bayesian forecasting, multilevel modeling, and probabilistic reasoning and inference under uncertainty using bayesian causality networks.