University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

SIMON DIEMERT

B.SEng (University of Victoria, 2015)

"A Mathematical Basis for Medication Prescriptions and Adherence"

Department of Computer Science

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Engineering Computer Science Building
Room 468

Supervisory Committee:
Dr. Jens Weber, Department of Computer Science, University of Victoria (Supervisor)
Dr. Morgan Price, Department of Computer Science, UVic (Member)

External Examiner:
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Dr. Simon Devereaux, Department of History, UVic

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Abstract

Medication prescriptions constitute an important type of clinical intervention. Medication adherence is the degree to which a patient consumes their medication as agreed upon with a prescriber. Despite many years of research, medication non- adherence continues to be a problem of note, partially due to its multi-faceted in nature. Numerous interventions have attempted to improve adherence but none have emerged as definitive. A significant sub-problem is the lack of consensus regarding definitions and measurement of adherence. Several recent reviews indicate that discrepancies in definitions, measurement techniques, and study methodologies make it impossible to draw strong conclusions via meta-analyses of the literature.

Technological interventions aimed at improving adherence have been the subject of ongoing research. Due to the increasing prevalence of the Internet of Things, technology can be used to provide a continuous stream of data regarding a patient's behaviour. To date, several researchers have proposed interventions that leverage data from the Internet of Things, however none have established an acceptable means of analyzing and acting upon this wealth of data.

This thesis introduces a computational definition for adherence that can be used to support continued development of technological adherence interventions. A central part of the proposed definition is a formal language for specifying prescriptions that uses fuzzy set theory to accommodate imprecise concepts commonly found in natural language medication prescriptions. A prescription specified in this language can be transformed into an evaluation function which can be used to score the adherence of a given medication taking behaviour. Additionally, the evaluator function is applied to the problem of scheduling medication administrations. A compiler for the proposed language was implemented and had its breadth of expression and clinical accuracy evaluated. The results indicate that the proposed computational definition of adherence is acceptable as a proof of concept and merits further works.