Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy
of
FANG DONG
MSc (Wuhan University, 2013)
BSc (Wuhan University, 2011)
“Copula Theory and Its Applications in Computer Networks”
Department of Computer Science
Thursday, June 22, 2017
9:00 A.M.
Engineering and Computer Science Building
Room 468
Supervisory Committee:
Dr. Kui Wu, Department of Computer Science, University of Victoria (Co-Supervisor)
Dr. Venkatesh Srinivasan, Department of Computer Science, UVic (Co-Supervisor)
Dr. Lin Cai, Department of Electrical and Computer Engineering, UVic (Outside Member)
External Examiner:
Dr. Zongpeng Li, Department of Computer Science, University of Calgary
Chair of Oral Examination:
Dr. Dan Russek, Department of Hispanic Studies, UVic
Dr. David Capson, Dean, Faculty of Graduate Studies
Traffic modeling in computer networks has been researched for decades. A good model should reflect the features of real-world network traffic. With a good model, synthetic traffic data can be generated for experimental studies; network performance can be analysed mathematically; service provisioning and scheduling can be designed aligning with traffic changes. An important part of traffic modeling is to capture the dependence, either the dependence among different traffic flows or the temporal dependence within the same traffic flow. Nevertheless, the power of dependence models, especially those that capture the functional dependence, has not been fully explored in the domain of computer networks.

This thesis studies copula theory, and applies copula analysis for better performance evaluation and network resource provisioning. We apply copula to model both contemporaneous dependence between traffic flows and temporal dependence within the same flow. The dependence models are powerful and capture the functional dependence beyond the linear scope. With numerical examples, real-world experiments and simulations, we show that copula modeling can benefit many applications in computer networks, including, for example, tightening performance bounds in statistical network calculus, capturing full dependence structure in Markov Modulated Poisson Process (MMPP), MMPP parameter estimation, and predictive resource provisioning for cloud-based composite services.