Online advertising can target users at a fine level of granularity. To do this effectively, we need models to represent users and their behavior. In this thesis, we study several problems related to models of online users.

- We implement a user-profile driven ad crawler system and empirically investigate the relationship between user profiles and ads shown to them. We observe user profiles play a greater role in display ads than in video ads.
- We design a neural network model \texttt{app2vec} to vectorize mobile apps, by looking at how users use these apps. We analyze the learned app vectors qualitatively and quantitatively and use these vectors to design efficient algorithms for app-install advertising, such as ad conversion prediction and ad selection.
- Finally, we design a lookalike audience extension system. Advertisers provide a list of past converters as “seed users”, and our system determines users similar to the seed. Rather than assuming linear separability of lookalike and non-lookalike users like in prior work, we propose a campaign specific nearest-neighbor based approach. Our system works efficiently on billions of users and effectively improves ad campaign conversion rate in practice at Yahoo!.

Defense Committee: S. Muthukrishnan (chair), Badri Nath, Tomasz Imielinski and Satyen Kale (Yahoo! Labs)