Vineet Kumar

Biosketch

Vineet Kumar is a faculty member at Yale School of Management, with interests at the intersection of technology and Business. His substantive focus is on digital business models. Products based on digital technologies are ubiquitous across a wide range of industries, from financial services to healthcare to media. He aims to develop a careful understanding of how consumers make choices on purchase and consumption, and how firms can design, develop and market these products. Methodologically, his work develop models from microfoundations of consumer and firm behavior informed by theory and domain knowledge. He also develops theory-based machine learning for business applications, incorporating human domain knowledge (theory) into ML algorithms, to improve performance and human interpretability and explainability.

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CV is available here:

<https://vineetkumars.github.io/VineetKumarCV.pdf>

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Title of Talk:

Generative Interpretable Visual Design for Preference Measurement and Visual Market Structure Mapping

This presentation will be based on two related projects. The first project is published and the second project is ongoing research.

The first paper develops a method to automatically discover and quantify human-interpretable visual characteristics directly from product image data. The method is generative, and can create new visual designs spanning the space of visual characteristics. It builds on disentanglement methods in deep learning using variational autoencoders, which aim to discover underlying statistically independent and interpretable visual characteristics of an object. The impossibility theorem in the deep learning literature indicates that supervision with ground truth characteristics would be required to obtain unique disentangled representations. However, these are typically unknown in real world applications, and are in fact exactly the characteristics we want to discover. Extant machine learning methods are unsuitable since they require ground truth labels for each visual characteristic. In contrast, this method postulates the use of readily available product characteristics (such as brand and price) as proxy supervisory signals to enable disentanglement. This method discovers and quantifies human-interpretable and independent characteristics without any specific domain knowledge on the product category. It is applied to a dataset of watches to automatically discover interpretable visual product characteristics, obtain consumer preferences over visual designs, and generate new ideal point designs targeted to specific consumer segments.

The second paper focuses on understanding how visual design allows firms an opportunity to differentiate their products. Using data on automobiles, we first obtain disentangled visual characteristics, and then combine them with functional characteristics to visualize market structure maps. These maps are then used to obtain insights in understanding how the competitive positioning in the space of functional characteristics is different than the positioning in visual characteristics. We find insights at multiple levels of market analysis: segment (or submarket), brand and product. At the segment level, we show how overlapping segments separate when visual characteristics are added. At the brand level, we connect the visual characteristics to branding choices made by firms, and show how this differentiates their offerings. At the product level, we show how the closest competitor in functional characteristics is likely to be misleading, and show how visual characteristics should be incorporated in decisions. Overall, the research shows the value of visual characteristics and using it in conjunction with functional characteristics to help answer questions of importance to both researchers and practitioners.

Link to the first paper:

<http://vineetkumars.github.io/Papers/GenerativeVisualDesign.pdf>

Link to the second paper:

http://vineetkumars.github.io/Papers/MarketMappingVisual.pdf

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