

# Making Sense of Big Data with Visualization

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# Big Data Analytics @CSE







# HKUST UrbanVis

VisLab @ Hong Kong University of Science and Technology

Welcome to HKUST UrbanVis, a research project of visualization group, [VisLab](#), at the [Department of Computer Science and Engineering, Hong Kong University of Science and Technology](#).

We dedicate to exploring diverse themes that help to address the needs in urban planning, urban management and urban service with novel and insightful visualization and analysis techniques.

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## Introduction

Urbanization and wide spread of information technologies transform cities into huge data pools. This big data provides new opportunities to reveal the hidden dimensions of the city and better understand the processes taking place within its physical boundaries. Urban visualizations can create awareness about important urban conditions and provide a valuable insight into how cities perform and

## News & Highlight

 We have one paper accepted by IEEE International Conference on Big Data (IEEE BigData 2015) in Santa Clara, CA, USA. **new**

# UrbanVis@HKUST

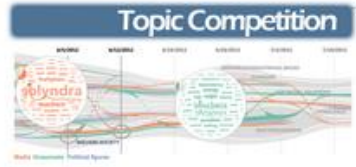
Urbanization and wide spread of information technologies transform cities into huge data pools. This big data provides new opportunities to reveal the hidden dimensions of the city and better understand the processes taking place within its physical boundaries. Urban visualizations can create awareness about important urban conditions and provide a valuable insight into how cities perform and how people interact with the urban environment, thus making it possible for extensive applications with high social and business values in modern cities.

We dedicate to exploring diverse themes that help to address the needs in urban planning, urban management and urban service with novel and insightful visualization and analysis techniques.

UrbanVis Team: Wenchao Wu, Yixian Zheng, Haipeng Zeng, and Prof. Huamin Qu

## Social Media

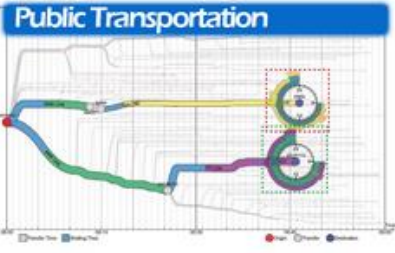
Social media is a basic and important means of people's communication in their daily life. Effective visualization and analysis of social media data will enable extensive applications with high social and business values in modern society.



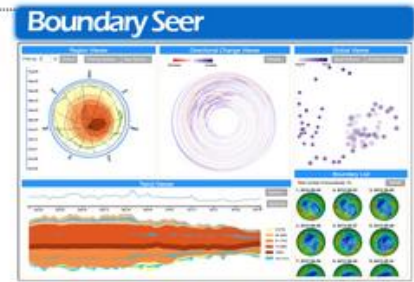
## Human Mobility

Massive amount of movement data, such as daily trips made by millions of citizens or thousands of taxis in a city, is widely available nowadays. Effective visual analysis of human mobility based on movement data provides a highly valuable means to evaluate the urban transportation system, facilitate urban planning and elevating the economic efficiency.

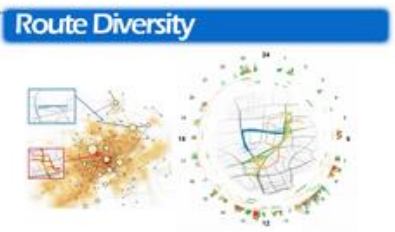
2015



2014



2013



2012

2011

2010

## 3D Simulation

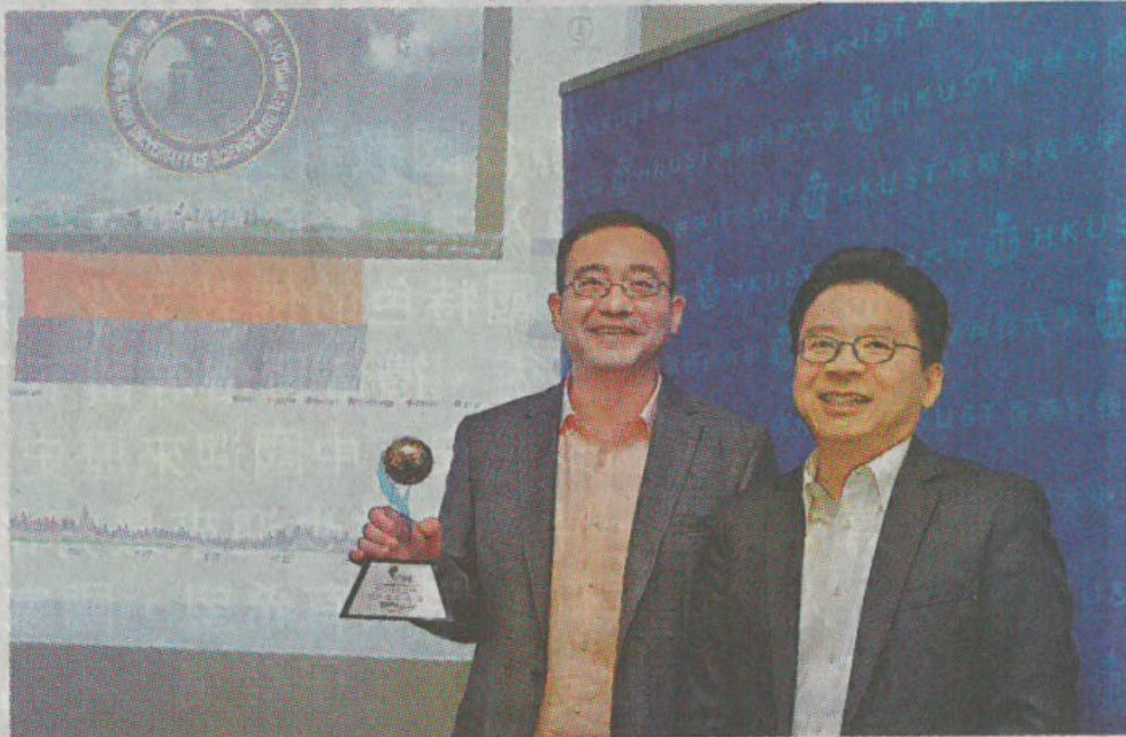
With the rapid development of technologies,



# VisMOOC

2015年4月16日(星期四) 香港 **文匯報** WEN WEI PO

A30

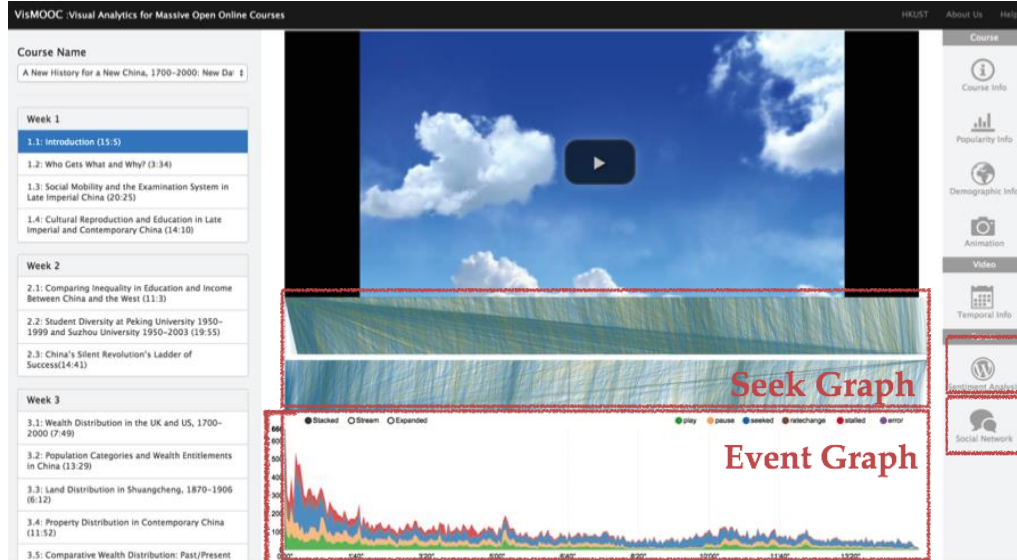


■ 因應可供全球進修人士學習的MOOC平台，屈華民(左)和龐鼎全(右)開發出首個視像分析系統，透過網絡學習行為互動提高教學質素。

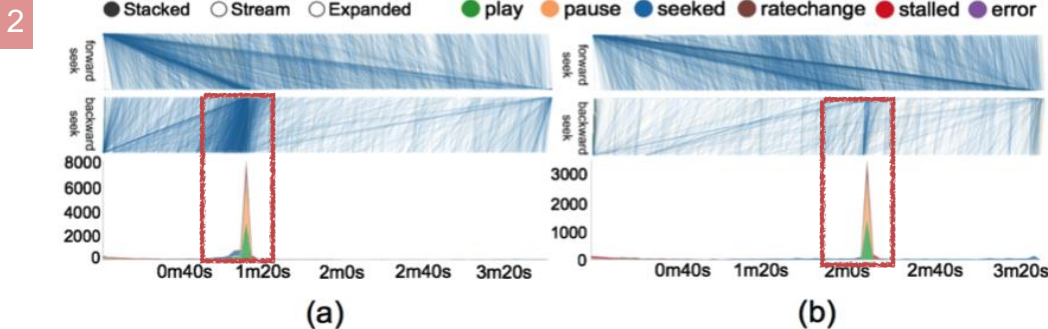
科大圖片

# VisMOOC: Visual Analytic System for MOOCs

1 Interface: List View(left), Content-based View(middle), Dashboard(right)

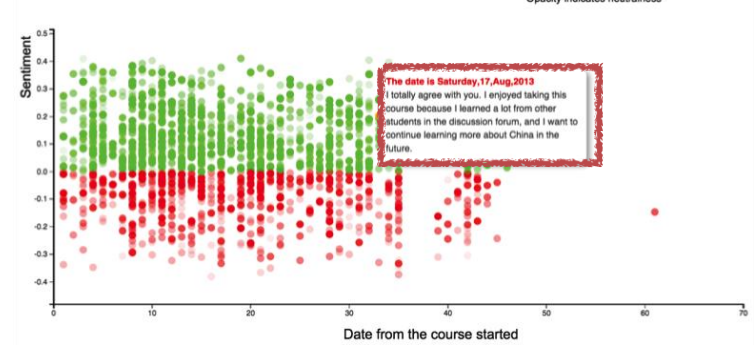


## Basic Clickstream Analysis Seek Graph vs. Event Graph



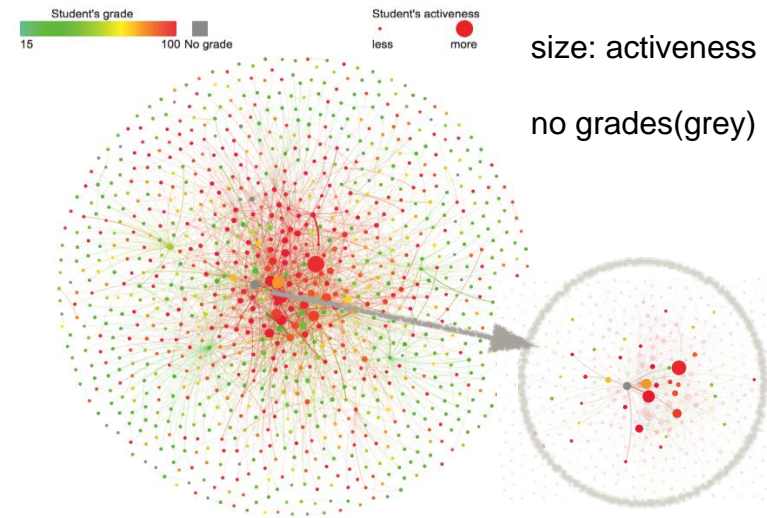
## Forum Sentiment Analysis

3 Positive vs. Negative Posts



## Forum Social Network

4 High grades(red) vs. Low grades(green)

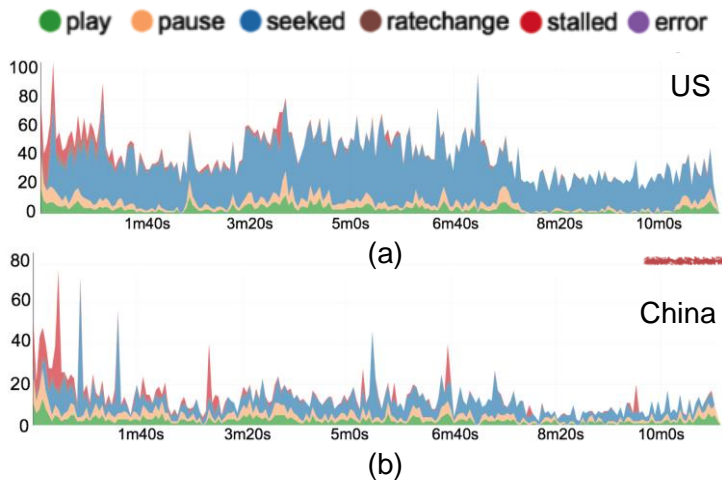




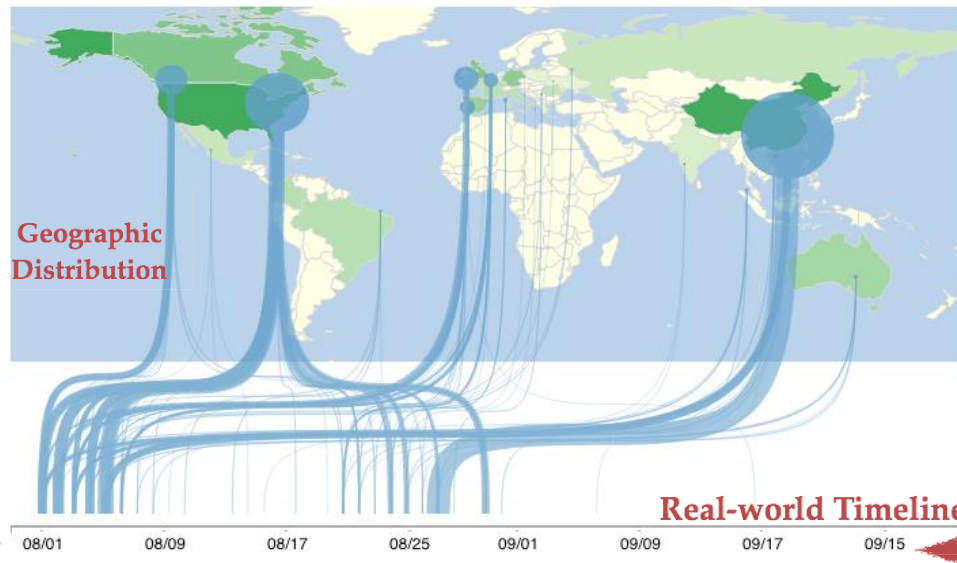


# Advanced Clickstream Analysis (from Spatio-temporal Perspective)

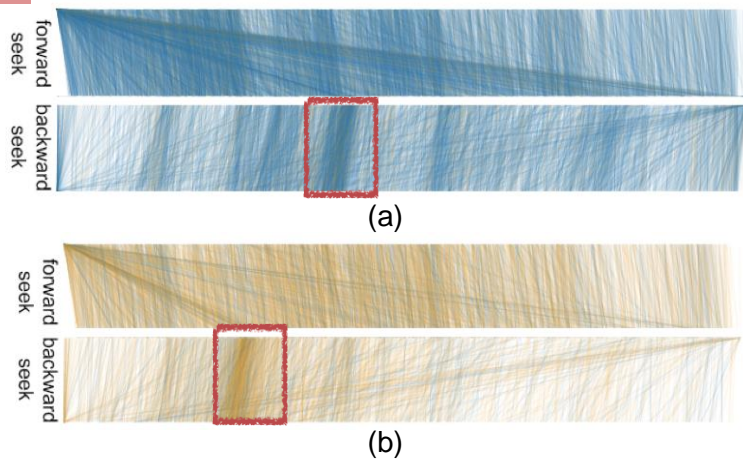
## 5 Event graph comparison (filtered by country)



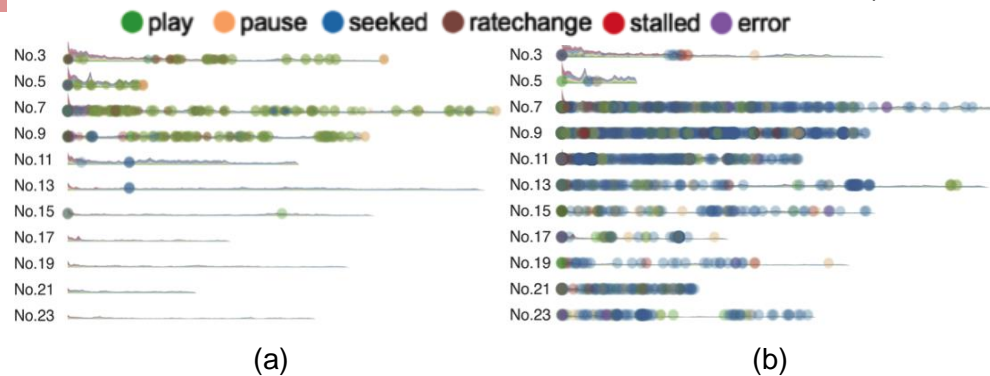
## 7 Seek Action Analysis (spatio-temporal distribution)



## 6 Seek graph comparison (filtered by date)



## 8 Animation for clickstream (first watch vs. review. exam burst)





# Memory TV

## 科大生研「記憶電視」防腦退化

【大公報訊】實習記者羅嘉雯報道：我們可能也想不到人的心率能配合架子鼓等樂器，轉化成美妙的音樂；一部古老的黑白電視機可以降低老年痴呆症的機率；傳統的青皮戲亦能活化成現代的電子遊戲……香港科技大學與中國美術學院合辦「設計思維」暑期課程，40名參與學生設計出一系列有助訓練長者身體機能，以及減輕腦退化的產品和多媒體設計作品。

科大工業工程及物流管理學系助理教授區艷莉介紹，今年科大已是第三年與中國美術學院合辦「設計思維」暑期課程，其特別之處在於不是在課堂做筆記，而是在得到訓練及到老人院實地調查後動手實踐，與美院合作是希望能把科學與藝術結合起來，讓學生明白要將一件產品推出市場要綜合考慮其功能性和外觀設計。40名參與課程學生來自從大一新生到博士研究生的不同學系，被分成四人一組完成一項產品設計。

將要升讀大三的科大機械工程學系學生石子晉說，自己從小看電視長大，也喜歡與家人分享影視劇的故事

情節，於是萌生了設計「Memo-TV記憶電視」的想法，希望通過用以往的影視劇內容喚起老人家的回憶，並與家人朋友分享，亦能好像「打麻將」一樣快樂。他與團隊一起搜集了香港和內地從1915年到2015年的影視劇照片、音樂、報紙新聞等，並將其通過軟體導入一部黑白電視機，讓玩家通過電視機上兩個旋鈕旋轉，簡單切換年份和頻道。

### 心率配合樂器變音樂

在現場試玩的76歲老人羅三妹認為學生們「又叻又貼心」，她最喜歡的是「記憶電視」，她說自己的丈夫患有腦退化，由於現代的電視機按鈕多，遙控介面亦很複雜，丈夫看電視時經常需要人幫助「轉台」，但是在看「記憶電視」時，由於只有兩個旋鈕，界面相對簡單，丈夫自己亦能完成調台操作，而且看到播的是舊片會異常開心，例如見到電影《黃飛鴻》那張照片時，就會跟家人分享「我知道這個是黃飛鴻」。

科大生物醫學工程系研究生一年

級學生鄭佳悅，與其團隊設計出名為「Sound of Body聲X體」的產品，通過把測量長者心率、膚溫和運動等生理指標的感應器與架子鼓連接，電腦程式接收感應器數據，並控制電機轉動，轉化成聲音信號播放。電腦內設置了八種不同的音樂，加上可以配合不同的樂器，因此根據不同的生理指標數據可以播放出各種不同的音樂。

鄭佳悅表示，希望通過電子音樂

與樂器的結合，給老人家一個愉悅的心情，也給年輕人一種聆聽長者心聲的感覺。她說在與美院的學生合作過程中，能明顯感受到大家的思維方式非常不同，科大的學生考慮更多的是方案的可行性、產品的功能性，美院的同學則更注重傳播理念和產品外觀，經常會發生矛盾，但是經過相互的溝通，總能和諧解決問題。



◀「記憶電視」的設計者石子晉（右一）和試玩的老人家

實習記者  
羅嘉雯攝

# HCI Initiatives







# HCI Initiative

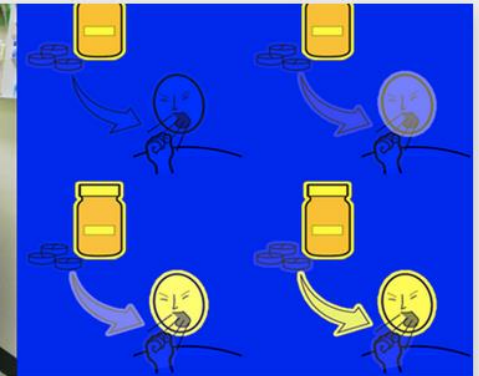
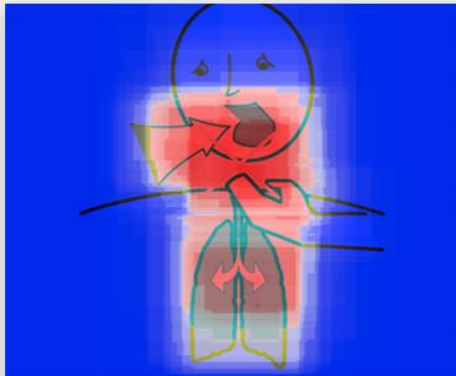


HOME

PEOPLE

Human-Computer Interaction Lab @  
HKUST

SUPPO



Design Adaptive Utility-Optimal Displays via *Social Mind/Eye Tracking*

Social Mind/Eye Tracking



# HUMAN-COMPUTER INTERACTION INITIATIVE

The Department of Computer Science and Engineering has established a new human-computer interaction (HCI) group. Our HCI initiative will focus on data-driven approaches to empowering the seamless integration of the digital realm and the physical world, and demonstrate the excellence through ground-breaking innovations, high-impact publications, novel education programs, and recognition by the industry.

## i What is Human-Computer Interaction?

Human-computer interaction (HCI) researches the design and use of computer technology, focusing particularly on the interfaces between people (users) and computers. Researchers in the field of HCI both observe the ways in which humans interact with computers and design technologies that lets humans interact with computers in novel ways. As a field of research, HCI is situated at the intersection of computer science, behavioral sciences, design, media studies, and several other fields of study.

## 17 What are the major research activities?

- o **Frontend:** intelligent, natural user interface – multimodal and multisensory interaction with data
  - Visual and sonified interface (e.g., visualization, sonification, speech, animation, virtual/augmented reality, 3D printing, etc.)
  - Tangible interface (e.g., mobile devices, wearable devices, smart environment, etc.)
- o **Backend:** making sense of data to gain better knowledge of the crowd and the environment
  - User modeling (e.g., social media, crowdsourcing, etc.)
  - Context modeling (e.g., urban computing, affective computing, etc.)
- o **Thinking:**
  - Design philosophies that integrate merits from Eastern and Western thinking (e.g., sustainability, harmony, etc.)
  - Design theories related to new media and platforms (e.g., game, E-learning, etc.)
  - Design methodologies and practices using MIT media lab, Stanford d.school, etc. as benchmarks

## Q Highlights

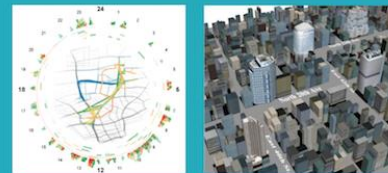
New pedagogy: HCI @ Intersection of technology, art, and entrepreneurship  
Short courses and summer camp  
Workshops, forum, consortium, and open day  
Seminar series and distinctive lectures

## 📖 What are the major applications?

Intelligent, human-friendly interface for robots and drones:  
HCI + Robotics



Urban dynamics: HCI + Smart City



Education: HCI + E-learning



Living with Data: HCI + Healthcare



# Visualization Research

- Inter-disciplinary research:
  - Data mining + computer graphics + human-computer interaction
- Strong art components
- Important applications
  - E-learning; urban informatics; social network and social media; healthcare

