

## IEEE CIS Distinguished Lecture Program

By Prof James C Bezdek, University of Melbourne

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Date of Event:	1 <sup>st</sup> October 2021
Time:	7 PM – 8.30 PM (GMT+8)
Event Platform:	Virtual (Google Meet)
Hosted by:	IEEE Computer Intelligence (CIS) Malaysia Chapter
Coordinator:	Dr Veronica Lestari Jauw ( <a href="mailto:Veronica.Jauw@nottingham.edu.my">Veronica.Jauw@nottingham.edu.my</a> ) Executive Committee, IEEE CIS Malaysia Chapter
Attendance:	43 (Registered)
DLP Title:	Streaming Data Analysis: Clustering ... or Classification?

**Abstract**

This talk concerns models and algorithms that are generally described as “streaming clustering”. Some of the semantics and methods that are used in this field are co-opted from static clustering: but often, they don’t serve their purposes for streaming data very well. A review of “state of the art” methods such as sequential k-means, Birch, Clustream, Denstream, etc. shows that methods borrowed from classical batch techniques don’t transfer well to the streaming data case. Most of these models fail to acknowledge that the data are seen but once in real streaming analysis (e.g., intrusion detection). When the data are not saved, batch clustering ideas such as pre-clustering assessment, partitioning, and cluster validity are not relevant. I do not argue that current approaches to streaming clustering are wrong: rather, they are transitional methods which will eventually lead to a new and useful paradigm for this type of computation. Several new models are briefly reviewed and illustrated (albeit poorly, with small labeled data sets!). The conclusions? Useful analysis of real streaming data is in its infancy. We need to carefully define the objectives of streaming analysis, and then choose terminology and methods that suit this evolving paradigm.

- A. Review of the three canonical problems in Static Clustering
- B. Characterization of streaming data: importance for applications like intrusion detection. When the data are not saved, the three canonical problems and their semantics are not relevant.

- C. Models and algorithms that are generally described as “streaming clustering”; Leader algorithm, sequential kmeans, Birch, Clustream, Denstream
- D. Semantics and methods that are used in this field are co-opted from static clustering
- E. Incremental Stream Monitoring Functions capture behavior of stream “clustering” algorithms.
- F. Visualization of streaming data with evolving images captures behavior of iVAT imagery streaming data.
- G. My contention that streaming clustering is really online classification – NOT clustering.

## **Bibliography**

Jim received the PhD in Applied Mathematics from Cornell University in 1973. Jim is past president of NAFIPS (North American Fuzzy Information Processing Society), IFSA (International Fuzzy Systems Association) and the IEEE CIS (Computational Intelligence Society): founding editor the *Int'l. Jo. Approximate Reasoning* and the *IEEE Transactions on Fuzzy Systems*: Life fellow of the IEEE and IFSA; recipient of the IEEE 3rd Millennium, IEEE CIS Fuzzy Systems Pioneer, and IEEE technical field award Rosenblatt medals; and the IPMU Kempe de Feret award. Jim's interests: woodworking, optimization, motorcycles, pattern recognition, cigars, clustering in very large data, fishing, co-clustering, blues music, visualization of high dimensional data, poker. Jim retired in 2007, and will be coming to a university near you soon.

## Events

The screenshot shows a Zoom meeting interface. The main content area displays three slides:

- Slide 1:** "IEEE CIS Malaysia Ongoing/Upcoming Events". It features a small video of a man and text about the IEEE CIS Malaysia 3-Minute Thesis (3MT) Virtual Competition 2021. The text states: "An 80,000 word thesis would take 9 hours to present. Their time limit... 3 minutes". It also lists eligibility criteria: "All active PhD candidates who are currently registered with their universities".
- Slide 2:** "IEEE CIS MALAYSIA EXCELLENCE THESIS AWARDS 2021". It announces the acceptance of nominations for "BEST PHD THESIS and BEST MASTER'S THESIS" to recognize outstanding research work. It lists eligibility criteria and award categories: "1. Neural Networks, 2. Fuzzy Systems, 3. Evolutionary Computing, 4. Other sub-areas under Computational Intelligence".
- Slide 3:** "Machine Learning Hands-On with R" (2-3 October 2021) and "Summer School: Machine Learning and Deep Learning Applications" (4-7 October 2021). The Summer School slide includes details like "Date: 4-7 October 2021", "Time: 1:00 PM to 5:00 PM (Monday - Thursday)", and "Digital Certificate will be provided".

On the right side of the Zoom window, there is a grid of participants. Visible names include Veronica Jauw, Ibrahima Faye, Jim Bezdek, TAHA MAHMOUD ABBAS..., NUR SHAHIRAH BINTI NOR..., Jeffery Kong, and 12 others. The bottom status bar shows the time as 19:03 and the meeting name as "IEEE CIS DLP by Prof James".

Figure 1. Dr Ibrahima Faye, Chairman of IEEE CIS Malaysia Chapter, introducing IEEE CIS and our ongoing activities

**Slide 1: We use 3 kinds of Label Vectors : Here they are @ c = 3**

**Crisp Labels (3 vertices)**

**Fuzzy or Probabilistic (Triangle)**

$N_{h,3} = \{e_1, e_2, e_3\}$

$e_3 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$

$e_2 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$

$e_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$

$N_{p,3} = [0, 1]^3 - \{0\}$

$N_{f,3} = \text{conv}(N_{h,3})$

$z = \begin{pmatrix} 0.7 \\ 0.2 \\ 0.7 \end{pmatrix}$

$y = \begin{pmatrix} 0.1 \\ 0.6 \\ 0.3 \end{pmatrix}$

$\frac{1}{c}$

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**Slide 2: Is streaming data analysis important or useful ? YES !**

Consider just one problem: **INTRUSION DETECTION**

Real unlabeled data stream continuously along the internet: the importance of good intrusion detection is obvious

The infamous KDD-99 Cup data (a favorite in streaming cluster research) were created by DARPA to enable such studies

494, 020 samples, 41 features

- Normal: 97, 277 (19.69%)
- U2R: 52 (0.01%)
- DoS: 391, 458 (79.24%)
- R2L: 1, 126 (0.23%)
- Probe: 4, 10 (0.83%)

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Figure 2. Methodology of data clustering presented by Prof James C Bezdek

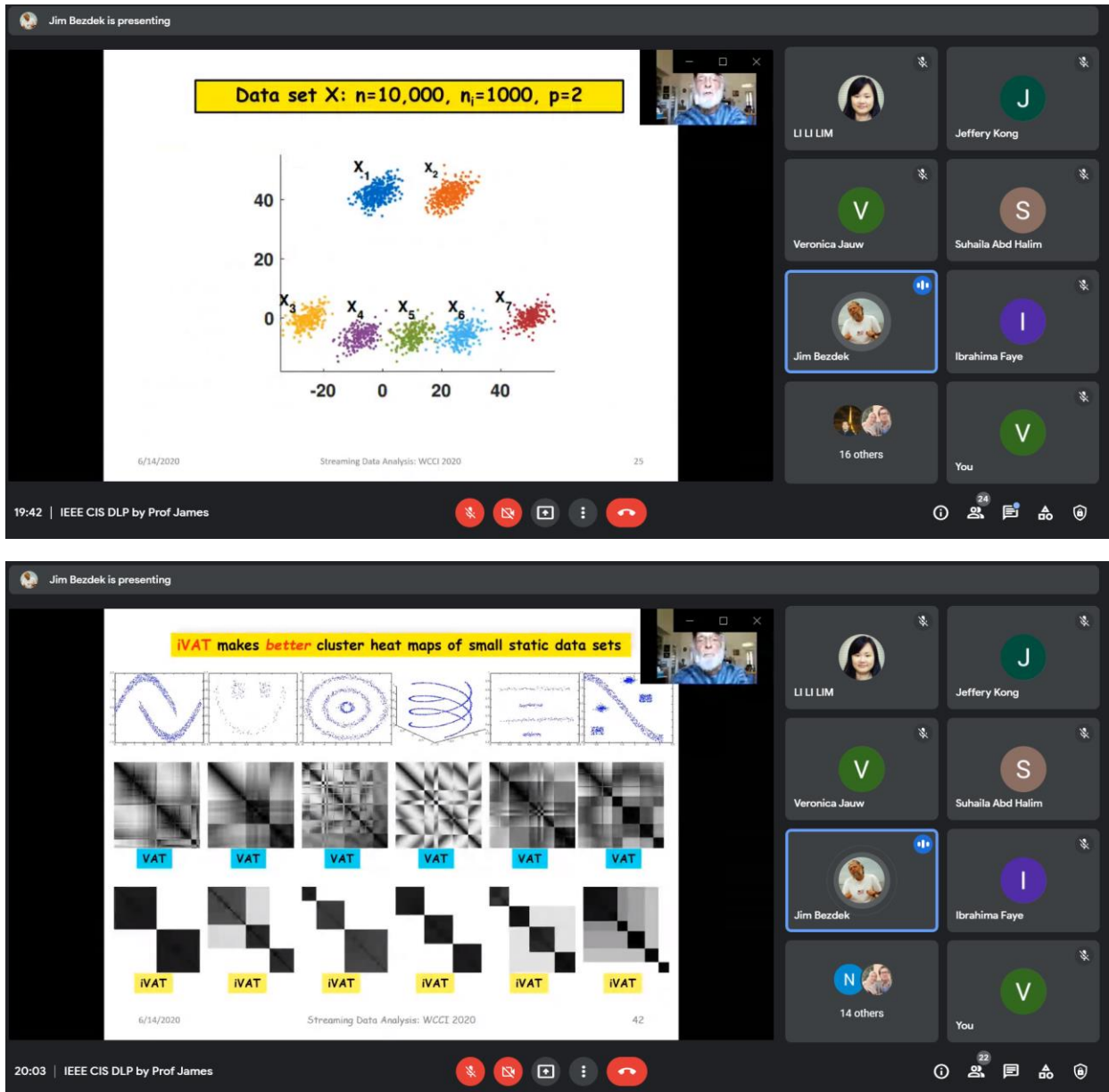


Figure 3. The comparative results of the different clustering methodologies.

## List of Participants

Full Name	Affiliations	IEEE Member (Y/N)
Hermawan Nugroho	University of Nottingham Malaysia	Yes
Poh Tik Jie	University of Nottingham Malaysia	No
Lim Wei Kang	University of Nottingham Malaysia	Yes
Ibrahima Faye	Universiti Teknologi PETRONAS	Yes
ZAZILAH MAY	Universiti Teknologi Petronas	Yes
Mohd Zaki Ayob	UniKL	Yes
LOO CHU KIONG	University of Malaya	Yes
Ahmed Mubarak Al-Haiqi	Uniten	Yes
Yong Ching Yee	University College of Technology Sarawak	Yes
Raphael UWAMAHORO	UTeM	Yes
Ahmad Zuri Shaameri	Universiti Teknologi Malaysia	Yes
ADUWATI SALI	UPM	Yes
TAHA MAHMOUD ABBAS	School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), Skudai, Malaysia	No
SUHAILA BINTI ABD HALIM	UNIVERSITI TEKNOLOGI MARA	Yes
MAZURA MAT DIN	UNIVERSITI TEKNOLOGI MARA	Yes
Jeffery Kong Tzer Huei	Curtin University, Malaysia	Yes
LU LI	Universiti Putra Malaysia	Yes
Lila Iznita Izhar	UTP	Yes
Ts Dr Lam Wai Leong	KFHM	Yes
Dinesh Sathyamoorthy	STRIDE	Yes
Ir. NOOR MOHD FADZLI OTHMAN	PETRONAS	Yes
Lim Chee Kau	UM	Yes
Lim Li Li	Tunku Abdul Rahman University College	Yes
Ong Lee Yeng	Multimedia University	Yes
Leow Kang Ren	Multimedia University	Yes
Lim Zhou Yi	Multimedia University Malaysia	Yes
Tan Pei Kuan	Multimedia University (MMU)	No
Yasmin Mumtaz Ahmad	UKM	Yes
HANI HAZZA ALI AHMED	UniMAP	Yes
RABIU HARUNA	Universiti Teknologi Malaysia	Yes
Lim Jia You	Monash University Malaysia	No



Elissa Nadia Bt Madi	Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin (UniSZA), Besut Campus, Terengganu, Malaysia	Yes
Saidatul Norlyana Azemi	Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis,	Yes
Weng Kin Lai	Tunku Abdul Rahman University College	Yes
Muhammad Muizz Mohd Nawawi	IIUM	Yes
RABIU HARUNA	Universiti Teknologi Malaysia	Yes
Mohamed Tahir Umar Ahmed Shoani	Universiti Tun Hussein Onn Malaysia (UTHM)	No
Rosli Abdul Hamid	Jaringan Semangat Sdn Bhd	Yes
Maharaz Mujtaba Karaye	Universiti Putra Malaysia	Yes
Sazalinsyah Razali	Universiti Teknikal Malaysia Melaka	Yes
Ida Suzana Hussain	uniten	Yes
ERNEE SAZLINAYATI OTHMAN	Universiti Teknologi PETRONAS	Yes
Nur Shahirah Binti Nor Shahrudin	IIUM	No