

LUIAS Distinguished Lecture

Self-supervised Learning

Speaker

Professor Josef KITTLER

Distinguished Professor

Centre for Vision, Speech and Signal Processing

Institute for People Centred AI

University of Surrey

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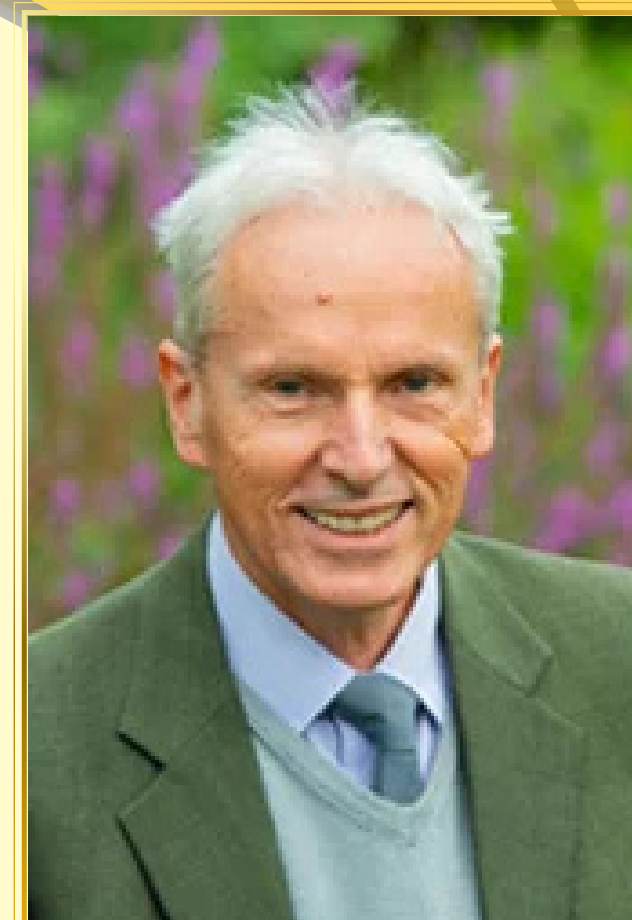


Date: 30 January 2026 Time: 2:30PM - 3:30PM

Venue: LYH201/2, 2/F, Lau Lee Yuen Haan

Amenities Building

Mode: Face-to-face



Abstract

Self-supervised learning (SSL) is recognised as an essential tool for building foundation models for Artificial Intelligence applications. The advances in self-supervised learning have been made thanks to vigorous arguments about the principles of self-supervised learning and through extensive empirical research. The aim of this paper is to contribute to the development of the underpinning theory of self-supervised learning, focusing on the deep clustering approach. We formulate the learning problem as K-L divergence optimisation, which leads to self-distillation, with updates for the student and the teacher network grounded in principled mathematical arguments. This leads to a novel method of teacher distribution normalisation using inverse cluster priors. We show that using Jensen inequality this normalisation simplifies to the popular batch centering procedure. We also derive the conditions for stable learning, which can be satisfied either using differential temperature for the student and teacher, or with the help of judicious data augmentation strategies. These are common practices in SSL, but our theoretical underpinning explains them within a single framework. The theoretical model developed not only supports existing successful SSL methods, but also suggests directions for future investigations which would further enhance the understanding of the SSL process, as well as beneficially impacting on its outcome.

Biography

Prof Josef Kittler has been a Research Assistant in the Engineering Department of Cambridge University (1973--75), SERC Research Fellow at the University of Southampton (1975-77), Royal Society European Research Fellow, Ecole Nationale Supérieure des Telecommunications, Paris (1977--78), IBM Research Fellow, Balliol College, Oxford (1978--80), Principal Research Associate, SERC Rutherford Appleton Laboratory (1980--84) and Principal Scientific Officer, SERC Rutherford Appleton Laboratory (1985). He also worked as the SERC Coordinator for Pattern Analysis (1982), and was Rutherford Research Fellow in Oxford University, Dept. Engineering Science (1985). He joined the Department of Electrical Engineering of Surrey University in 1986 as a Reader in Information Technology, and became Professor of Machine Intelligence in 1991 and gained the title Distinguished Professor in 2004.

Selected awards/recognition:

- **IAPR Fellow (1998).** "For contributions to computer vision and pattern recognition, and for outstanding leadership in IAPR".
- **IEEE/IET Fellow (1999).** IET fellowship honours those who "Lead by example. Inspire the next generation. Help to shape the profession."
- **FREng (2000).** Royal Academy of Engineering Fellows represent "the nation's best engineering researchers, innovators, entrepreneurs, business and industry leaders."
- **KS Fu Prize (2006).** This biennial prize is given to a living person "in recognition of an outstanding technical contribution to the field of pattern recognition".
- **IET Faraday Medal (2008).** The most prestigious of the IET Achievement Medals.
- **EURASIP Fellow (2009).** "For contributions to pattern recognition, image processing and computer vision".

ALL ARE WELCOME

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