

# Type-2 Fuzzy Sets and Systems

*SSCI 2017 Tutorial, Jon Garibaldi*

## Abstract

General type-2 fuzzy sets and systems are paradigms which enable fine-grained capturing, modelling and reasoning with uncertain information. While recent years have seen increasing numbers of applications from control to intelligent agents and environmental management, the perceived complexity of general type-2 fuzzy sets and systems still makes their adoption a daunting and not time-effective proposition to the majority of researchers. This tutorial is designed to give researchers a practical introduction to general type-2 fuzzy sets and systems.

## Outline

The tutorial will address three main aspects of using and working with general type-2 fuzzy sets and systems:

1. Introduction to General Type-2 Fuzzy Sets and Systems: this will provide attendees with a concise and practice-led overview of general type-2 fuzzy sets and systems, reviewing the motivation behind their definition, and their structure in relation to type-1 and interval type-2 fuzzy sets and systems.
2. Design and Applications of General Type-2 Fuzzy Sets and Systems: the programmatic implementation and use of general type-2 fuzzy sets and systems will be briefly reviewed, highlighting areas from inference to the design of general type-2 fuzzy sets, including a key set of recently introduced processes to create general type-2 fuzzy sets from data.
3. Coding General Type-2 Fuzzy Sets and Systems: participants will be supported in the development of a simple general type-2 fuzzy system based on the freely available Juzzy, Python and/or R based general type-2 APIs.

## Intended Audience

This tutorial is intended for researchers who have a basic or advanced familiarity with standard (type-1) fuzzy sets and systems but wish to know more about the theory and practical application of type-2 fuzzy sets and systems. No specific expertise of coding or computer languages is required – all practical examples will be given in elementary terms suitable for beginners.

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Prof. Jon Garibaldi received the BSc degree in Physics from Bristol University in 1984, and MSc degree and PhD from the University of Plymouth in 1990 and 1997, respectively. Prof. Garibaldi is currently Head of School of Computer Science, University of Nottingham, and Head of the Intelligent Modelling and Analysis (IMA) Research Group. His main research interests include modelling uncertainty and variation in human reasoning, and in modelling and interpreting complex data to enable better decision making, particularly in medical domains. Prof. Garibaldi is the current Editor-in-Chief of IEEE Transactions on Fuzzy Systems.

