

## **Exploring the intersection of soft computing and generative methods**

As is well known, in 2012 A. Krizhevsky et al. won the ImageNet Large Scale Visual Recognition Challenge using a convolutional neural network developed through a combination of advanced computer hardware (i.e. general purpose computing using GPUs), large labelled datasets, and network architectures that were much deeper and contained many more parameters than the previous state-of-the-art. This event was the culmination of many years of machine learning contributions, and it led to the widespread use of machine learning in academia, industry, and society. Recently, generative models – *i.e.* models that can generate new example data based on underlying distributions in the training sets – have demonstrated the extraordinary ability to create novel, advanced, and sophisticated content for specific domains. These models have already exhibited a potential impact as big as the introduction of convolutional neural networks in 2012.

Many of these generative methods learning a mapping from the training set data distribution to an abstract domain called the latent space. Once trained, random multi-dimensional points from this latent space are used to generate new samples that contain the important perceptual or semantic characteristics of the training set distribution but represent a completely new synthetic data point. Here, there is an opportunity to explore soft computing methods to provide new systematic avenues for influencing the data generation process. One such example would be using soft computing methods to condition the output of these models. Soft computing methods can be used to extract and approximate patterns contained in subsets, or collection of subsets, of the datasets used to train the diffusion models. These patterns can then be used in the conditioning process. Thus, the focus of this session is to explore how soft computing and generative methods can be combined for better data generation methods.

The not exhaustive list of topics includes:

- Generative methods
  - Normalizing flows
  - Autoregressive models
  - Variational autoencoders
  - Energy-based models
  - Generative adversarial networks
  - Transformers
  - Diffusion models
- Soft computing
  - Rough sets
  - Near sets
  - Probabilistic rough sets
  - Hybrid methods
  - Fuzzy, rough, near

### **Review process of special session submissions**

Papers submitted to accepted special sessions will be treated as regular papers from both the perspective of the review process of the proceedings (e.g. length, timeline). However, the session organizers will be asked to nominate reviewers.

**Important Dates** – This session will follow the IJCRS 2025 schedule. The dates are repeated here.

- Deadline for paper submission: January 5, 2025
- Notification of acceptance: March 20, 2025
- Deadline for camera-ready version of accepted paper: April 6, 2025
- Conference: May 11-13, 2025

### **Organizers**

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