

DS200: Research Methods

Module3

Summaries of Seminars

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1. Seminar 1

Name of The Seminar: "Magnetic Resonance: Application to Single- and Multi-Phase Flows exploiting undersampling in magnetic resonance"

Summary: An introduction Magnetic Resonance was given. Applications of single phase and multi phase flows and how they can be used to for numerical flow simulation. This team was employed by Shell. So they used these single phase and multi phase flows to gain an understanding of the rock cores.

2. Seminar 2

Name of the Seminar: "Highly scalable asynchronous algorithm for partial differential equations: a path towards Exascale"

Summary: An asynchronous method on finite difference schemes for PDEs was developed while moving towards Exascale. The asynchronous algorithm developed for finite difference schemes without any synchronization between processing elements. The errors converge to first order regardless of the scheme.

3. Seminar 3

Name of the Seminar : "Powerful large-scale data-driven inferences"

Summary: The research focuses on controlling false discovery rate using different oracle and data-driven procedures. The research tries to maximize true positives subject to a weighted false discovery rate.

Using weights provides an effective strategy domain knowledge large-scale testing. The two strategies discussed were procedural weights approach and decision weights. These methods have reduced the propagation of false discovery rate.

4. Seminar 4

Name of the Seminar : "Role of Water cooling in Heat treatment of metals"

Summary: This seminar focuses on water cooling and transfer of heat in metals during this process. How to retain the crystal structure when using water cooling.

The research focuses on the keeping the water direction constant while cooling a metal and the moving the metal top to bottom so as to retain the crystal structure. This reduces corrosion.

5. Seminar 5

Name of the Seminar : "A novel strategy for defining the aggregate interactome (protein-protein interaction network) in models of Alzheimer amyloidopathy"

Summary: The research focuses on protein protein interaction to find neuro-degenerative diseases. The proteins aggregated in the plaque of the cells were identified. Next a model was developed since proteins aggregation suggested a chemical pathway.

The protein aggregates of neuro-degenerative consisted proteins whose shapes had been completely destroyed which in turn affected how the protein functioned. Removing some of these proteins have shown some promise in tackling against neuro-degenerative diseases.

6. Seminar 6

Name of the Seminar : "PixelNN: Example-based Image Synthesis"

Summary: The research focuses on developing high-frequency photo realistic images from an "incomplete" signal such as a low-resolution image, a surface normal map, or edges. The present generative models are good at predicting one output for a given input. But they are not good at predicting one input and many outputs.

When given a very bad image or an image with low resolution, it gives only one output. But when you take the output and use Nearest Neighbours you can predict many outputs.

And using this technique you can generate some desired outputs such as given a trace diagram of a dog and you want to see which kinds of cats are close to this image. You can generate cats which look like the given input. Using Deep neural networks to classify the image data and then to break the neural network at some layer. And to use Nearest Neighbours Algorithm to find a better output.

7. Seminar 7

Name of the Seminar : "Asymptotic Analysis in Partial Differential Equations "

Summary: The research focuses on the mathematical homogenization to obtain the limiting behaviour of on an EBVP (elliptical boundary value problem) with an oscillating boundary.

8. Seminar 8

Name of the Seminar : "Entropy-regularized attention models in text analysis"

Summary: Two problems were discussed where new forms of entropy regularized attention is beneficial. Which are in turn used in named entity disambiguation for knowledge graphs. Strong accuracy improvements on standard benchmarks for NED using entropy regularized attention was discussed. In the past, asymmetric methods were used which the target word focused its attention on the source word.