Computational Intelligence – Advanced Seminar Summer 2021

Prof. Dr. A. Pech

Choice 1: Paper topics

Write an individual seminar paper on one of the topics given below. Limited number of slots for each topic. Make your choice on the Moodle course page. You may NOT work in groups. Papers will be checked for plagiarism.

List of topics

P1	EEG signal classification by deep learning
P2	Signal processing and machine learning for speaker identification
P3	Comparison of short time Fourier transform and wavelet transform
P4	Machine learning for audio signal processing
P5	Deep learning for signal processing applications
P6	The Wigner-Ville distribution
P7	The kurtogram in machine learning
P8	The use of the spectrogram in deep learning
P9	Comparison of spectrogram and wavelet transform
P10	Machine learning for discrete time signal processing
P11	The role of the Hilbert transform in machine learning
P12	The Hilbert-Huang transform
P13	The Wigner distribution using the example of audio data
P14	Comparison of Wigner distribution and wavelet transform
P15	The role of the spatial pooler in Hierarchical Temporal Memory
P16	Deep reinforcement learning
P17	Stochastic gradient descent variants
P18	Recent neuroevolution progress
P19	Recurrent spatio-temporal neural network (RSTNN)
P20	Multi-scale neural network
P21	Evolutionary transfer optimization
P22	Neuro-evolutionary transfer learning

Process the following sub-tasks:

I. Write a seminar paper. Give a detailed and scientifically sound description of the given topic: literature research (e.g. IEEE Digital Library), mathematics, algorithms, classification, applications, examples, possibly sample program.

II. Create a Power-Point presentation and submit it together with the seminar paper. It will foster your oral presentation.

III. Give an oral presentation of the topic and participate in the subsequent scientific discussion.

Processing hints

Amount of work: Not more than 15 pages. Using the template "Seminar-Paper-Template-A4 Comp Int 2021" is mandatory. You can download it from Moodle.

In a scientific paper source citation and quoting is mandatory.

Submission deadline is 22nd June 2021. Submit the following documents (Moodle upload by 23.55h):

- a digital copy of the seminar paper (WORD file),
- a Power-Point presentation (PowerPoint file).

Present your seminar paper. Presentation online in a Zoom-Session. Duration 15-20 minutes plus discussion. Presentation in June or July. Choose a presentation slot on the Moodle course page when available.

Grading: presentation and slides (0-4 points), seminar paper (0-14 points).

Computational Intelligence – Advanced Seminar Summer 2021
Prof. Dr. A. Pech

Choice 2: Project

You may work alone or in groups of 2-4 students. If you want to work in a group, then form a group of 2-4 students and choose one of the project tasks given below (make your choice on Moodle; limited number of groups per project). Write a project report. On project submission the contribution of each group member must be identified.

List of project tasks

T1	Classification of time signals by CNN using spectrogram
T2	Classification of time signals by CNN using kurtogram
T3	Classification of time signals by CNN using LSTM
T4	Classification of time signals by CNN using the Hilbert-Huang transform
T5	Classification of time signals by MLP using spectrogram
T6	Classification of time signals by MLP using kurtogram
T7	Classification of time signals by MLP using LSTM
T8	Classification of time signals by MLP using the Hilbert-Huang transform
T9	Classification of time signals by SVM using spectrogram
T10	Classification of time signals by SVM using kurtogram
T11	Classification of time signals by SVM using LSTM
T12	Classification of time signals by SVM using the Hilbert-Huang transform

Detailed task descriptions will be provided.

Process the following sub-tasks:

IV. Solve the given task. Write a detailed report including all necessary information for your (fictional) project successor: mathematics, algorithms, software design, source code, test data, test results.
V. Create a Power-Point presentation and submit it together with the project report. It will foster your oral presentation.
VI. Give an oral presentation and a demonstration of the project results and participate in the subsequent discussion.

Processing hints

Amount of work: Not more than 20 pages. Using the template "Seminar-Paper-Template-A4 Comp Int 2021" is mandatory. You can download it from Moodle.
In a scientific paper source citation and quoting is mandatory.

Submission deadline is 30th September 2021. Submit the following documents:

- a digital copy of the project report (WORD file, Moodle upload, by 23.55h),
- all materials, source code, plans, drawings (personally or Moodle upload, by 23.55h),
- a Power-Point presentation (PowerPoint file) if it applies.

Present your project result and discuss it with the audience. Presentation online in a Zoom-Session.

Grading: presentation and slides (0-4 points), task solution, program, project report (0-14 points).

I wish you success!
A. Pech

Grades
1 Brilliant performance. 16-18 points.
2 Good performance. 13-15 points.
3 Average performance. 9-12 points.
4 Adequate performance. 6-8 points.
5 Poor. 0-5 points or plagiarism (for all persons involved)