

CIV-ML's Seminars 2019-2020

September 30, 2020

Presenter: Shervin Khazael — Ph.D. Candidate, Polytechnique Montreal

Aug 17 2020

Title: Jacques Cartier Bridge Damage Scenarios Using Physical-based models.

Abstract: In this seminar we present the possible damage scenarios can occurred on the joints on Jacques Cartier using Finite Element Method (FEM). Different damage levels are examined to create a big picture of possible damages on the bridge. Also, we present a MATLAB-based package to automate analyzing the results. Finally, challenges and next steps will be discussed to advance the work.

Presenter: Bhargob Deka — Ph.D. Candidate, Polytechnique Montreal.

Jul 21 2020

Title: Online Bayesian Learning of Process Noise in State-Space Model.

Abstract: In this seminar, I present the application of the Noise Inference method for state-space models in univariate and multivariate time series models.

Presenter: Luong Ha Nguyen — Postdoc, Polytechnique Montreal.

Jul 07 2020

Title: Pooling, Normalization, and Data Augmentation.

Abstract: This seminar introduces different techniques for improving the performance of Bayesian convolutional neural networks on classification tasks.

Presenter: Zach Hamida — Ph.D. Candidate, Polytechnique Montreal

Jun 30 2020

Title: Review of Methods Utilized in Estimating Bridge Health Indices.

Abstract: In this talk, different methods for estimating bridge health index (BHI) are introduced. In addition, the presentation includes a discussion about the usefulness of BHI in maintenance planning and potential future analyses with MTQ dataset.

Presenter: Dahlia Tchoukuegno — B.Sc. Summer intern, Polytechnique Montreal

Jun 23 2020

Title: Damage Scenario Simulation Using Physical-Based Models.

Abstract: In this seminar we present the preliminary result for modelling different damage scenarios on infrastructures. The damage scenarios are introduced on three common components one can find on bridges including (i) stand-alone girder, (ii) slab-on-girders, and (iii) slab-on-truss components. The results of this stage ensure the reliability of the damage scenario modelling process that further will be used on Jacques Cartier and Samuel de Champlain bridges spans.

Presenter: Shervin Khazael — Ph.D. Candidate, Polytechnique Montreal

Jun 16 2020

Title: Anomaly Simulation Using Bayesian Dynamic Linear Model.

Abstract: In this seminar we introduce a framework to simulate stochastic anomaly in timeseries using Bayesian Dynamic Linear Model (BDLM). The objective of the simulation is to generate anomalous time series mimicking the behavior of the instrumented structure. The formalism and simulation will be presented, and the application will be discussed.

Presenter: Saeid Amiri — Research Associate, Polytechnique Montreal

Jun 02 2020

Title: Ensemble SVD-regularized approach to achieve clustering

Abstract: In this talk, we propose the ensemble SVD regularized approach to achieve clustering, it constructed from SVD and random subspace clus-

tering, we establish a series of technical results to justify our method. We provide numerous examples to compare them. This approach might be very useful under the high dimension data, where a lot of uninformative variables are in data, extracting informative variables (or a combination of variables) to find a distance metric or appropriate dissimilarity seem essential to provide an accurate inference on data. It is shown the proposed dissimilarity can be used in any machine learning technique instead the Euclidean distance.

Presenter: Van-Dai Vuong — Ph.D. Student, Polytechnique Montreal
May 26 2020

Title: Application of Bayesian Recurrent Neural network (BRNN) in time series.

Abstract: This seminar presents how to apply the tractable approximate Gaussian inference to Recurrent Neural Network Architecture. 2 examples with synthetic time series data are also presented to show the potential of the method.

Presenter: Bhargob Deka — Ph.D. Candidate, Polytechnique Montreal
May 19 2020

Title: Noise Inference method in State-Space Models.

Abstract: In this presentation, we will see the application of noise inference method applied in the state-space model framework and comparison with adaptive learning algorithms

Presenter: James-A. Goulet — Associate Professor, Polytechnique Montreal

May 12 2020

Title: Tutorial: Solving the Cartpole Problem (RL) with Bayesian Neural Networks.

Abstract: This presentation will show how to implement a temporal-difference Bayesian reinforcement learning problem. The example presented is the classic cartpole problem where the states are continuous and the actions are discrete. The function approximation employed will be the a Bayesian neural network using the tractable approximate Gaussian inference (TAGI) method.

Presenter: Bhargob Deka — Ph.D. Candidate, Polytechnique Montreal

May 05 2020

Title: Online Noise Inference in Neural Network: Application with TAGI.

Abstract: In this presentation, I will present the online inference of the hyper-parameter, variance of the observation error, in the TAGI architecture.

Presenter: Luong Ha Nguyen — Postdoc, Polytechnique Montreal

Apr 28 2020

Title: Tractable Approximate Gaussian Inference for Convolutional Neural Networks.

Abstract: This seminar presents the application of the tractable approximate Gaussian inference to convolutional neural networks. The potential of the proposed approach is illustrated in several datasets for classification tasks.

Presenter: James-A. Goulet — Associate Professor, Polytechnique Montreal

Apr 21 2020

Title: Partially Observable Reinforcement Learning with Bayesian Neural Networks.

Abstract: This seminar introduces the theory enabling the solution of partially observable reinforcement learning problems using Bayesian neural networks. The talk will cover three aspects (1) RL with discrete actions, (2) RL with continuous actions, and (3) Inverse RL.

Presenter: James-A. Goulet — Associate Professor, Polytechnique Montreal

Apr 14 2020

Title: Tractable Approximate Gaussian Inference for Bayesian Neural Networks.

Abstract: This presentation introduce the tractable approximate Gaussian inference (TAGI) method for Bayesian neural networks. The method enables: (1) the analytical inference of the posterior mean vector and diagonal covariance matrix for weights and bias, (2) the end-to-end treatment of uncertainty from the input layer to the output, and (3) the online inference

of model parameters using a single observation at a time. The method proposed has a computational complexity of $O(n)$ with respect to the number of parameters n , and the tests performed on regression and classification benchmarks confirm that it matches the performance of existing methods relying on gradient backpropagation.

Presenter: Shervin Khazaeli — Ph.D. Candidate, Polytechnique Montreal

Apr 07 2020

Title: Anomaly Detection Quantification Using Bayesian Network (Background and Proposition).

Abstract: In this seminar we present the basics of the Bayesian Network and their application in establishing causalities among various variables. The presentation will continue by introducing an example regarding a meta model of the Langensand Bridge. We identify the predictive importance of different factors affecting the vertical displacement of the bridge. Finally, we propose a framework for anomaly detection quantification based on the learnt agent that can trigger the alarm in case of anomalies.

Presenter: Dai Vuong — Ph.D. Student, Polytechnique Montreal

Mar 24 2020

Title: Modelling Nonlinear Dependency in BDLM.

Abstract: This presentation points out the limitation of the existing approach and propose a new method to model the non-linear dependency between 2 timeseries in BDLM. 2 examples using synthetic and real data are presented to demonstrate the validity.

Presenter: Bhargob Deka — Ph.D. Candidate, Polytechnique Montreal

Mar 17 2020

Title: Online Inference of Noise Parameters in SSM.

Abstract: In this talk, the potential of online estimation for univariate model parameters is discussed, especially in the context of Bayesian Dynamic Linear Models (BDLM).

Presenter: Shervin Khazaeli — Ph.D. Candidate, Polytechnique Mon-

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Dec 12 2019

Title: Probabilistic Decision Making to Detect Anomalies: Reinforcement Learning Approach.

Abstract: This seminar is dedicated to the advancement of the current project in the context of continuous monitoring of the infrastructures. Particularly, we focus on anomaly detection using Reinforcement Learning approach. We will introduce a framework that benefits from the capability of dynamic linear model to decompose sensory data and the ability of RL to obtain policies regarding detecting anomalies. Afterwards, the framework is examined on the real measurements from a bridge in Canada. Finally, we will identify new challenges for the remaining phases of the project.

Presenter: Zachary Hamida — Ph.D. Candidate, Polytechnique Montreal

Nov 28 2019

Title: Factoring Structural Attributes in Infrastructures' Deterioration Analysis (Analyses Results).

Abstract: In this seminar, kernel regression and state-space models are combined for modeling the deterioration behaviour of a bridge network. The gain from the proposed approach is demonstrated through analyses performed on real data.

Presenter: Bhargob Deka — Ph.D. Student, Polytechnique Montreal
Nov 14 2019

Title: Online pattern recognition for time series in the context of Structural Health Monitoring.

Abstract: This research focuses on developing a general framework for online pattern recognition of the structural responses so that continuous monitoring of a structure can be achieved. The purpose of this research is to support real-time decision making and provide required maintenance or replacement to the structure in time. Machine learning algorithms will be developed to achieve a framework that will be capable of de-noising and capturing the pattern in the data at the same time.

Presenter: Ali Saffar — Ph.D. Student, Polytechnique Montreal

Oct 31 2019

Title: Collapse Capacity Assessment of Irregular Tall Buildings Considering the Effect of Pulse Like Forward Directivity Ground Motions.

Abstract: In this presentation the collapse capacity of irregular tall buildings under near-field ground motions with directivity effect will be investigated. A number of building models with different number of stories, i.e. 15, 20, 25 stories, are designed based on the US seismic design guideline. Using 14 near field ground motions from PEER NGA database, the effect of near fault ground motion on the models will be evaluated.

Presenter: Shervin Khazaeli — Ph.D. Candidate, Polytechnique Montreal

Oct 25 2019

Title: Jacques Cartier Bridge Structural Health Monitoring

Abstract: In this seminar we take a closer look at the new measurement system for health monitoring of the Jacques Cartier bridge. The sensory network and collected measurements will be explained and discussed. At the end, the challenges corresponding to build data-driven models will be identified for next steps.

Presenter: Bhargob Deka — Ph.D. Student, Polytechnique Montreal

Oct 16 2019

Title: Online Pattern Recognition in Time Series: Case Studies

Abstract: Various case studies will be presented using new components such as TM and SPR. These components will allow modeling parameters such as AR coefficient and Regression coefficient as hidden states as well as time varying amplitude.

Presenter: Zachary Hamida — Ph.D. Candidate, Polytechnique Montreal

Oct 10 2019

Title: Modeling the Effects of Interventions in Infrastructures (Formulation)

Abstract: Interventions in infrastructures include different techniques that impact the health of structures in different ways. In this seminar, the database of interventions is presented. Thereafter, a model formulation to

quantify the effect of interventions is discussed.

Presenter: Dai Vuong — Ph.D. Student, Polytechnique Montreal

Oct 03 2019

Title: On the calculation of the lateral thrust in Buckling-Restrained Braces (BRBs)

Abstract: This seminar gives an introduction about structural elements called Buckling-Restrained Braces (BRBs) used in buildings, and investigates various factors which affect the behaviour of BRBs using numerical analysis and analytical estimates.

Presenter: Saeid Amiri — Research Associate, Polytechnique Montreal

Sept 26 2019

Title: Modeling event in Covariate Kernel regression

Abstract: We have developed a new component, Co-variate Kernel regression, in BDLM to model the transportation data. We will review the pros and cons of this model, and propose a new component to recognize the effect of event on transportation.

Presenter: Zachary Hamida — Ph.D. Candidate, Polytechnique Montreal

Sept 19 2019

Title: Factoring Structural Attributes in Infrastructures' Deterioration Analysis

Abstract: In this seminar, a technique for factoring structural attributes in the deterioration analysis will be presented. The presentation includes analyses on synthetic data for verification.