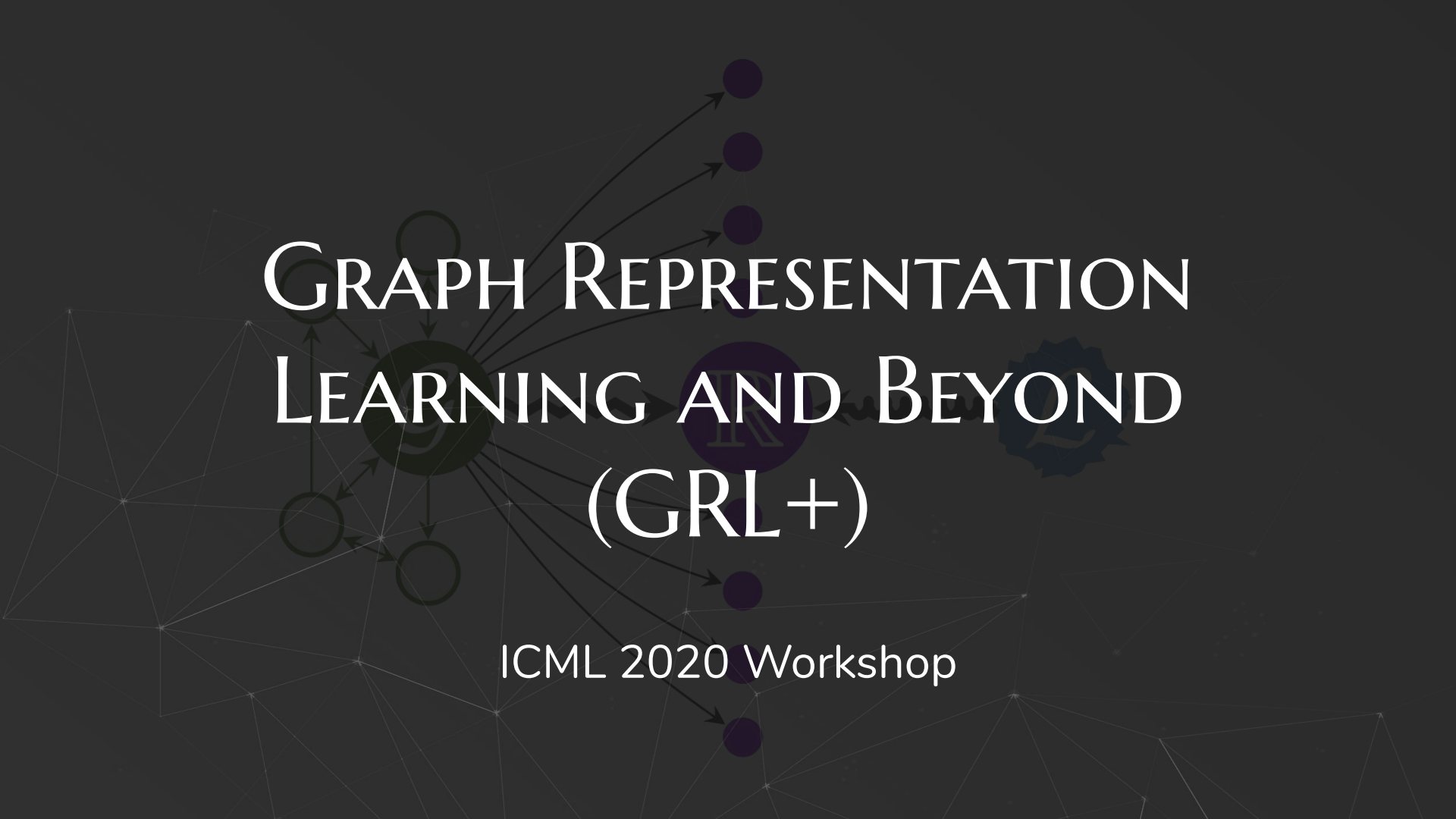
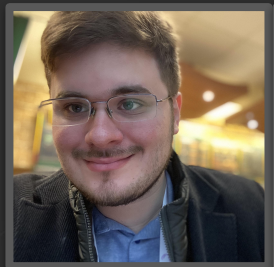


Graph Representation Learning and Beyond (GRL+)

ICML 2020 Workshop

Organisers



Petar Veličković

DeepMind

Michael Bronstein

Twitter / Imperial / USI Lugano

Andreea Deac

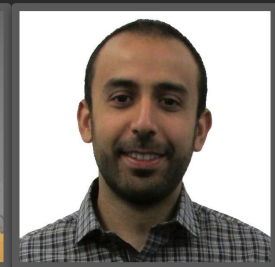
Mila / UdeM

Will Hamilton

Mila / McGill

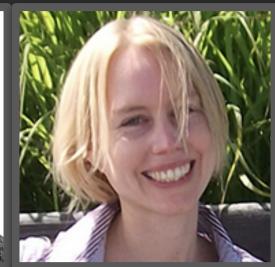
Jess Hamrick

DeepMind



Milad Hashemi

Google

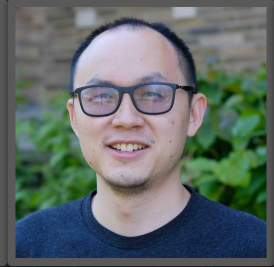


Stefanie Jegelka

MIT

Jure Leskovec

Stanford / Pinterest



Renjie Liao

University of Toronto

Federico Monti

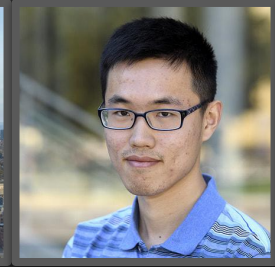
Twitter / USI Lugano

Yizhou Sun

UCLA

Kevin Swersky

Google Brain



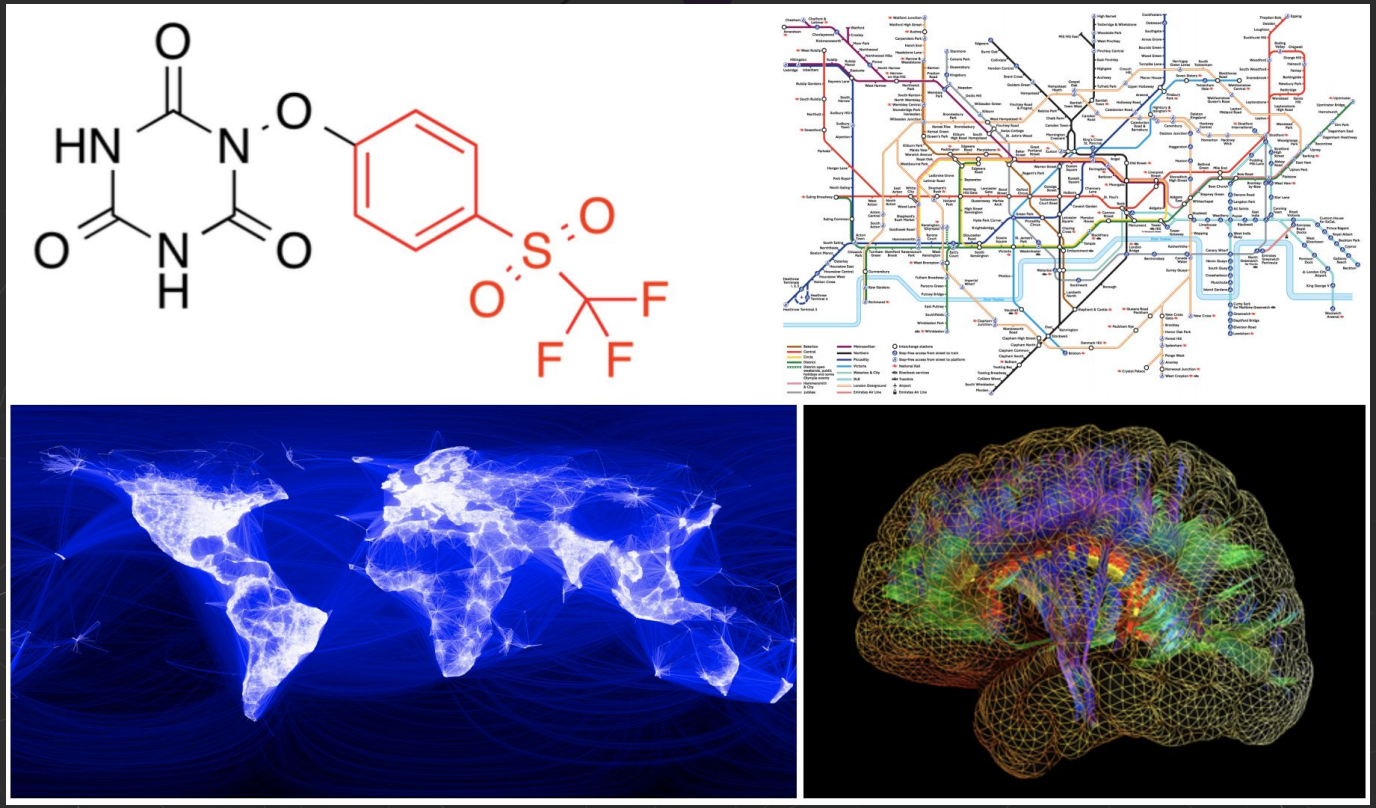
Rex Ying

Stanford

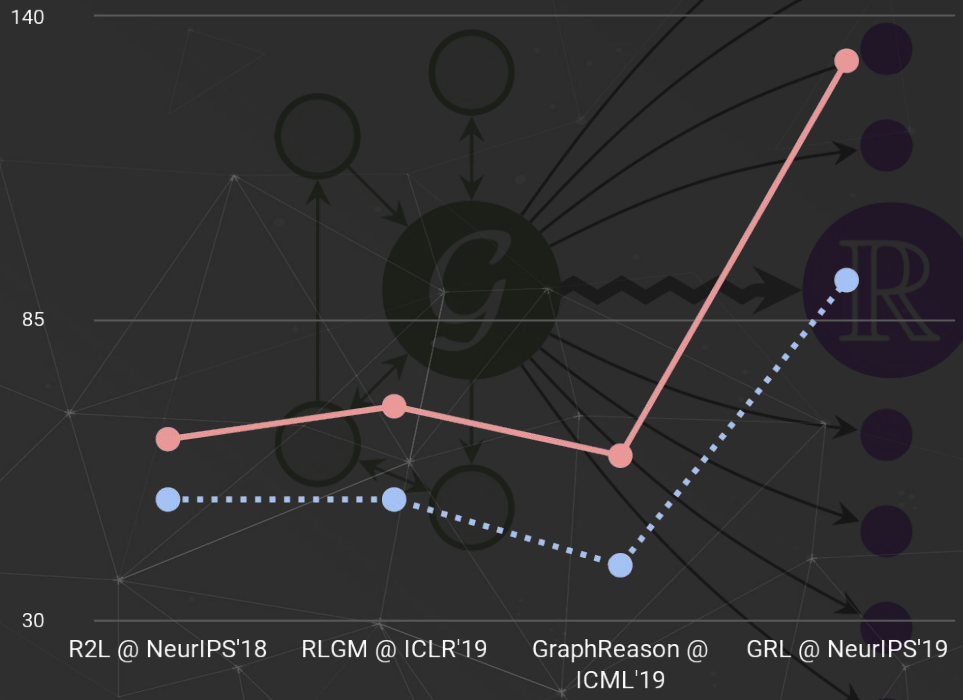
Marinka Žitnik

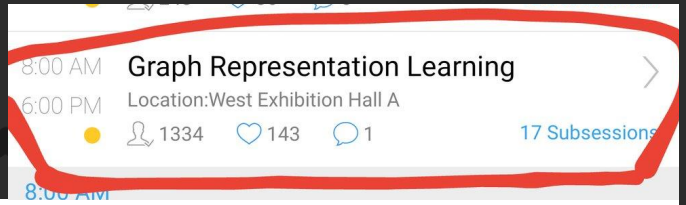
Harvard

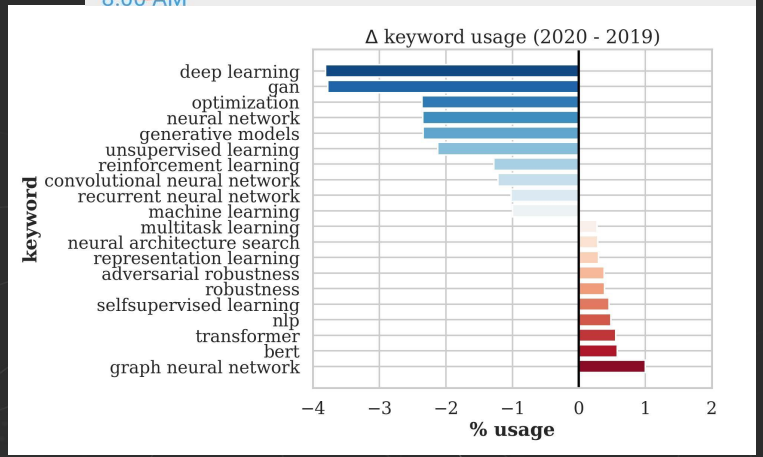
Graphs are **everywhere**!



A brief history of GRL workshops*



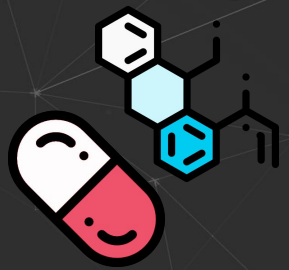


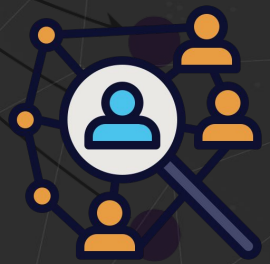


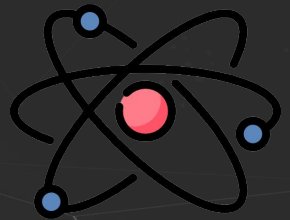
*Focusing only on ICML, ICLR and NeurIPS.

GRL broke into the **real world**!

- GNNs discover **novel antibiotics** (Stokes et al., Cell'20)
- GNNs power **web-scale recommender systems** (Ying et al., KDD'18; Pal et al., KDD'20)
- GNNs assist **particle physicists** (Martinez et al., Eur. Phys. J. Plus'19)







Emerging applications of GRL

- GNNs enhance **fake news detection** (Monti et *al.*, 2019)
- GNNs applied for **autonomous vehicle perception** (Gao et *al.*, CVPR'20)
- GNNs offer **repurposing candidates for COVID-19** (Gysi et *al.*, 2020)



GRL+ Acceptance stats

- **95** papers submitted
  - Out of which **41** tagged as a **Novel Application**
  - Out of which **9** tagged as a **COVID-19 Application**
- **73** papers accepted *(Acceptance rate: ~**77%**)*
  - One of the **largest** ICML 2020 workshops!
- **9** papers selected for contributed talks
  - Three each in **Original Research**, **Novel Applications**, and **COVID-19 Applications**
  - **Best paper awards** announced during **Closing Remarks**!

Program Committee (~110 reviewers!)

Aaron Zweig, *New York University*, **Agnieszka Słowik**, *University of Cambridge*, **Aleksandar Bojchevski**, *TU Munich*, **Aleksandar Stanić**, *IDSIA*, **Alvaro Sanchez-Gonzalez**, *DeepMind*, **Andreea Deac**, *Mila*, **Andrei Nicolicioiu**, *Bitdefender*, **Andrew Wang**, *Stanford University*, **Arantxa Casanova**, *Mila*, **Arian Jamasb**, *University of Cambridge*, **Bahare Fatemi**, *University of British Columbia*, **Beliz Gunel**, *Stanford University*, **Ben Day**, *University of Cambridge*, **Benoît Corsini**, *Element AI*, **Boris Knyazev**, *University of Guelph*, **Bowen Liu**, *Stanford University*, **Bruno Ribeiro**, *Purdue University*, **Bryan Perozzi**, *Google Research*, **Cătălina Cangea**, *University of Cambridge*, **Chaitanya Joshi**, *Nanyang Technological University*, **Charles Blundell**, *DeepMind*, **Charlie Nash**, *DeepMind*, **Chi Thang Duong**, *EPFL*, **Christopher Morris**, *Polytechnique Montréal*, **Cinjon Resnick**, *New York University*, **Cristian Bodnar**, *University of Cambridge*, **Daniel Daza**, *Vrije Universiteit Amsterdam*, **Daniele Grattarola**, *Università della Svizzera Italiana*, **Davide Bacciu**, *University of Pisa*, **Davide Belli**, *University of Amsterdam*, **Dominique Beaini**, *InVivo AI*, **Dongkwan Kim**, *KAIST*, **Duo Wang**, *University of Cambridge*, **Dylan Bourgeois**, *EPFL*, **Edward Smith**, *McGill University*, **Emanuele Rossi**, *Twitter*, **Emma Rocheteau**, *University of Cambridge*, **Fabrizio Frasca**, *Twitter*, **Felix Opolka**, *University of Cambridge*, **Gabriele Corso**, *University of Cambridge*, **Guangtao Wang**, *JD.com*, **Guillem Cucurull**, *Blue Prism*, **Guy Wolf**, *Université de Montréal*, **Haggai Maron**, *NVIDIA Research*, **Hanjun Dai**, *Georgia Institute of Technology*, **Helena Andrés-Terre**, *University of Cambridge*, **Ines Chami**, *Stanford University*, **Iulia Duță**, *Bitdefender*, **Jakub Tomczak**, *Vrije Universiteit Amsterdam*, **Jan Svoboda**, *NNAISENSE*, **Jessica Hamrick**, *DeepMind*, **Jiaxuan You**, *Stanford University*, **Jiezhong Qiu**, *Tsinghua University*, **Jin Dong**, *McGill University*, **Jingling Li**, *University of Maryland*, **Joey Bose**, *McGill University*, **Johannes Klicpera**, *TU Munich*, **Jordan Hoffmann**, *Harvard University*, **Jun Gao**, *University of Toronto, NVIDIA*, **Kevin Swersky**, *Google Brain*, **Komal Teru**, *McGill University*, **Koustuv Sinha**, *McGill University*, **Louis Tiao**, *University of Sydney*, **Louis-Pascal Xhonneux**, *Mila/Université de Montréal*, **Lu Liu**, *University of Technology Sydney*, **Luca Cavalleri**, *University of Cambridge*, **Lukas Galke**, *Kiel University / ZBW*, **Marc Brockschmidt**, *Microsoft Research Cambridge*, **Mariana Vargas Vieyra**, *INRIA Lille Nord Europe*, **Marinka Žitnik**, *Harvard University*, **Matthias Fey**, *TU Dortmund*, **Michal Valko**, *DeepMind*, **Milad Hashemi**, *Google*, **Min Jae Song**, *New York University*, **Momchil Peychev**, *ETH Zürich*, **Nick Choma**, *New York University*, **Niklas Stoehr**, *ETH Zürich*, **Otilia Stretcu**, *Carnegie Mellon University*, **Patrick Fernandes**, *Unbabel*, **Pau Riba**, *Computer Vision Center*, **Paul Scherer**, *University of Cambridge*, **Rafael Gómez-Bombarelli**, *Massachusetts Institute of Technology*, **Razvan Pascanu**, *DeepMind*, **Rex Ying**, *Stanford University*, **Ron Levie**, *TU Berlin*, **Ryoma Sato**, *Kyoto University*, **Sergey Ivanov**, *Criteo*, **Sergio Casas Romero**, *Uber ATG / University of Toronto*, **Shagun Sodhani**, *Facebook AI*, **Shengchao Liu**, *Mila*, **Sitao Luan**, *Mila*, **Sofia Ira Ktena**, *Twitter*, **Sri Charan Ragireddy**, *IIT Kharagpur*, **Thomas Kipf**, *Google Brain*, **Tiago Azevedo**, *University of Cambridge*, **Ting Chen**, *Google Brain*, **Vijay Prakash Dwivedi**, *Nanyang Technological University*, **Vikas Verma**, *Aalto University*, **Vikash Singh**, *Heal*, **Weihua Hu**, *Stanford University*, **Wengong Jin**, *Massachusetts Institute of Technology*, **Wenyuan Zeng**, *Uber ATG / University of Toronto*, **Will Hamilton**, *McGill University*, **Xiang Ren**, *University of Southern California*, **Xiaohui Zeng**, *University of Toronto*, **Xiaowen Dong**, *University of Oxford*, **Yizhou Sun**, *University of California, Los Angeles*, **Yujia Li**, *DeepMind*, **Yujun Yan**, *University of Michigan*, **Yunsheng Bai**, *University of California, Los Angeles*, **Yuwen Xiong**, *Uber ATG / University of Toronto*, **Zichao Yan**, *McGill University*

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Guy Wolf

Université de Montréal

Iulia Duță

Bitdefender

Niklas Stoehr

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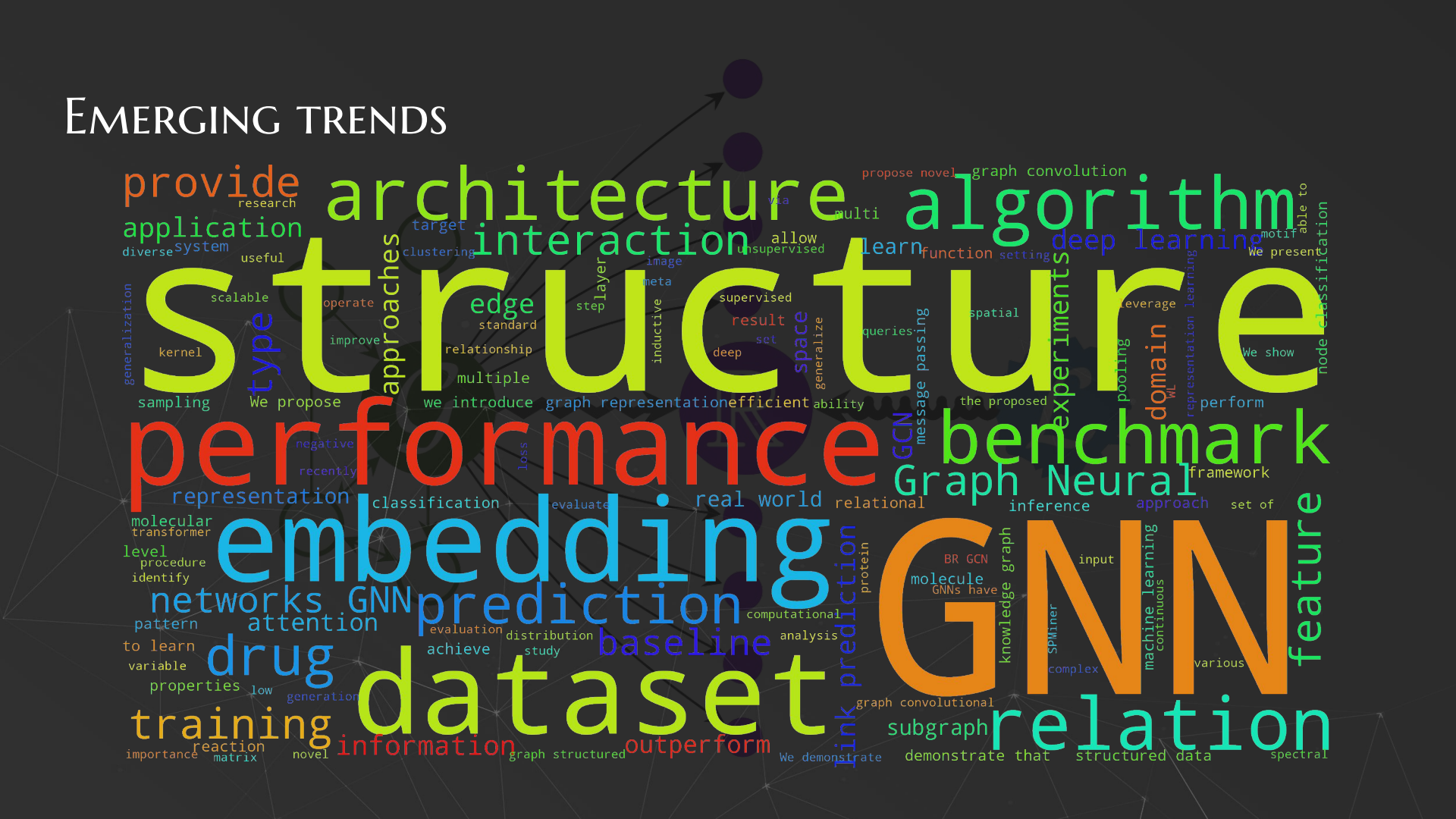
Emerging trends



Keynote speakers

Benchmarking Graph Neural Networks

Xavier Bresson
Nanyang Technological University

Keynote speakers

Relational Structure Discovery

Thomas Kipf
Google Brain

Keynote speakers

Insights from Physics on Graphs and Relational Inductive Bias

Kyle Cranmer
New York University

Keynote speakers

GCNs: From Summarization to Heterophily

Danai Koutra
University of Michigan, Ann Arbor

Keynote speakers

Geometric and Topological Graph Analysis for Machine Learning Applications

Tina Eliassi-Rad
Northeastern University

Keynote speakers

Graph Neural Networks for Self-Driving

Raquel Urtasun
University of Toronto / Uber ATG

Update Talks

Matthias Fey

TU Dortmund University

Zheng Zhang

NYU Shanghai / AWS

Jure Leskovec

Stanford / Pinterest

PyTorch geometric

DGL

OGB

GRL+ Schedule (Vienna Time)

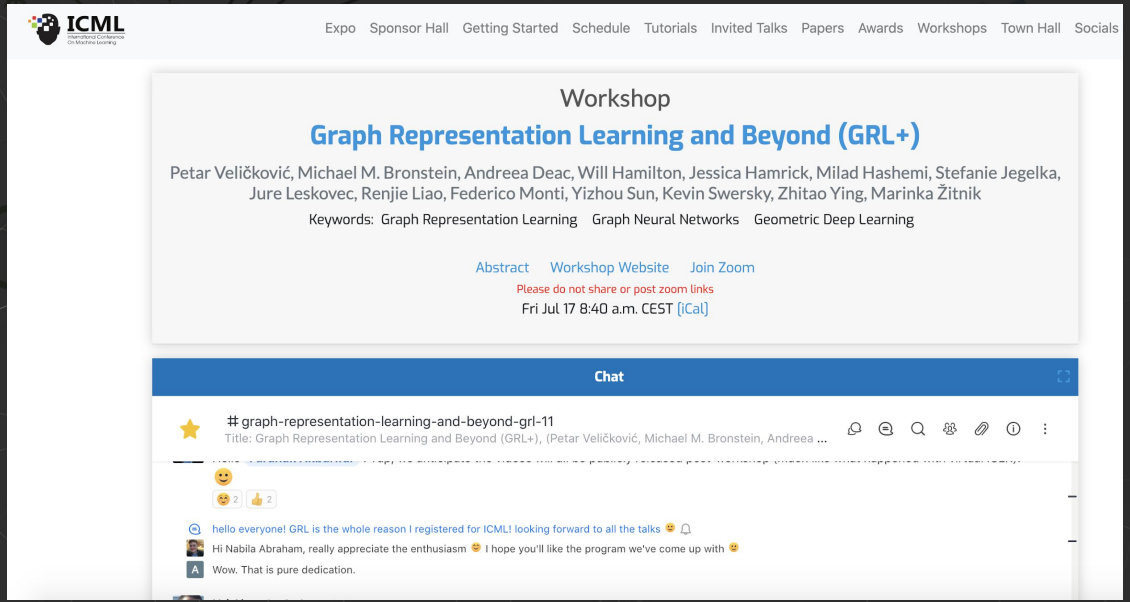
8:40--9:00AM: **Opening Remarks**
9:00--10:00AM: **Invited Talks** (Xavier Bresson, Thomas Kipf)
10:00--10:30AM: **Q&A / Discussion / Coffee 1**
10:30--11:30AM: **Virtual Poster Session #1**
11:30AM--12:00PM: **Contributed Talks** (Novel Applications)
12:00--12:30PM: **Updates** (PyTorch Geometric, Deep Graph Library, Open Graph Benchmark)
12:30--1:30PM: **Lunch Break**
1:30--2:15PM: **Contributed Talks** (Original Research)
2:15--3:15PM: **Invited Talks** (Kyle Cranmer, Danai Koutra)
3:15--3:45PM: **Q&A / Discussion / Coffee 2**
3:45--4:15PM: **Contributed Talks** (COVID-19 Applications)
4:15--5:15PM: **Invited Talks** (Tina Eliassi-Rad, Raquel Urtasun)
5:15--5:45PM: **Q&A / Discussion / Coffee 3**
5:45--6:45PM: **Virtual Poster Session #2**
6:45--7:00PM: **Closing Remarks**

https://grlplus.github.io/schedule/

Interacting with the workshop: Virtual Website

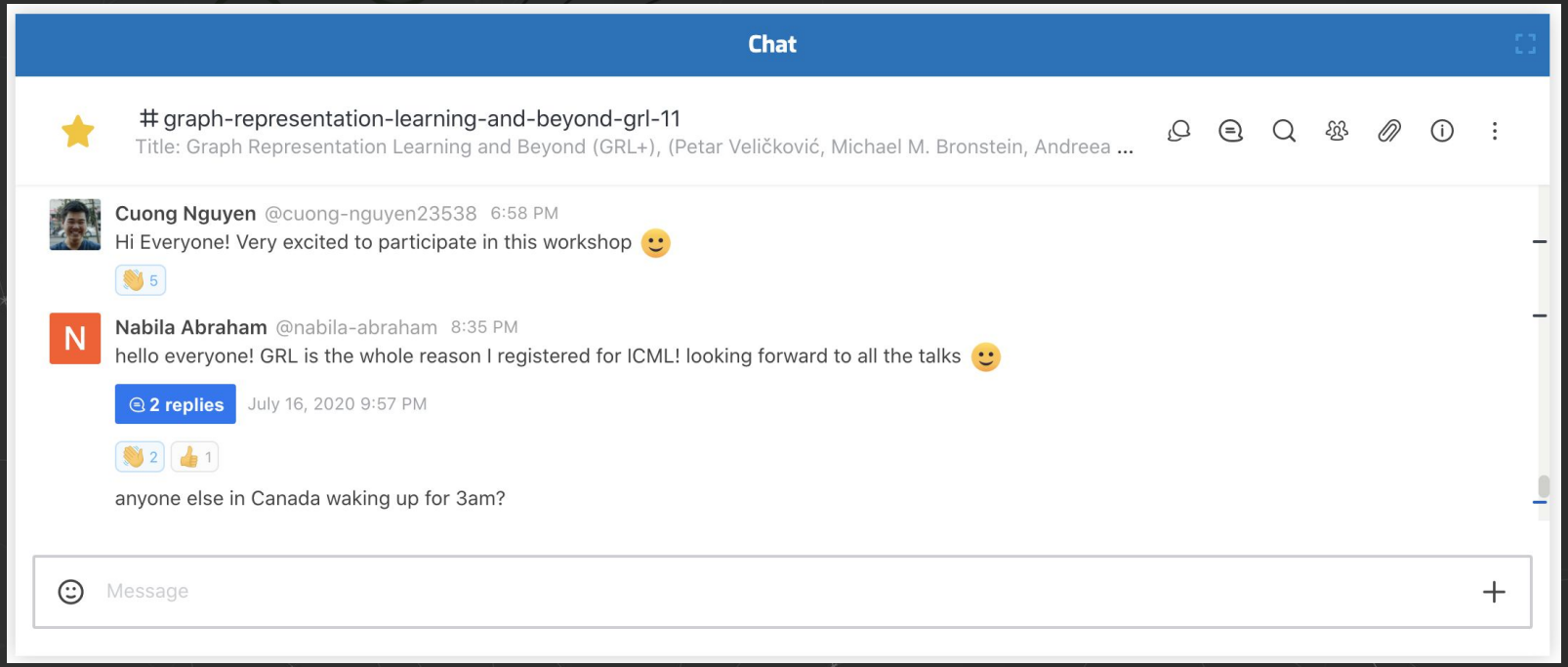
Virtual workshop website at:

https://icml.cc/virtual/2020/workshop/5715



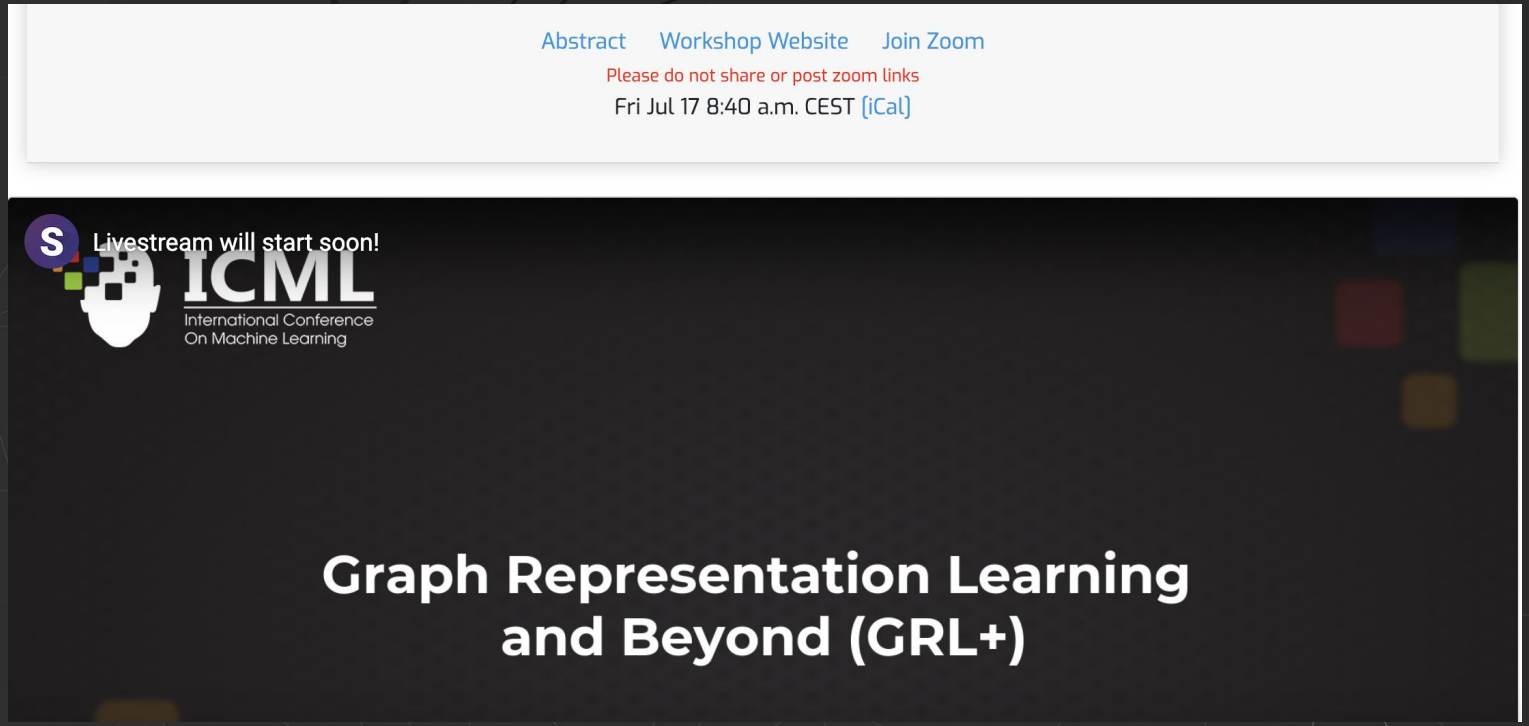
Interacting with the workshop: RocketChat

We will use **RocketChat** throughout the workshop for async communication



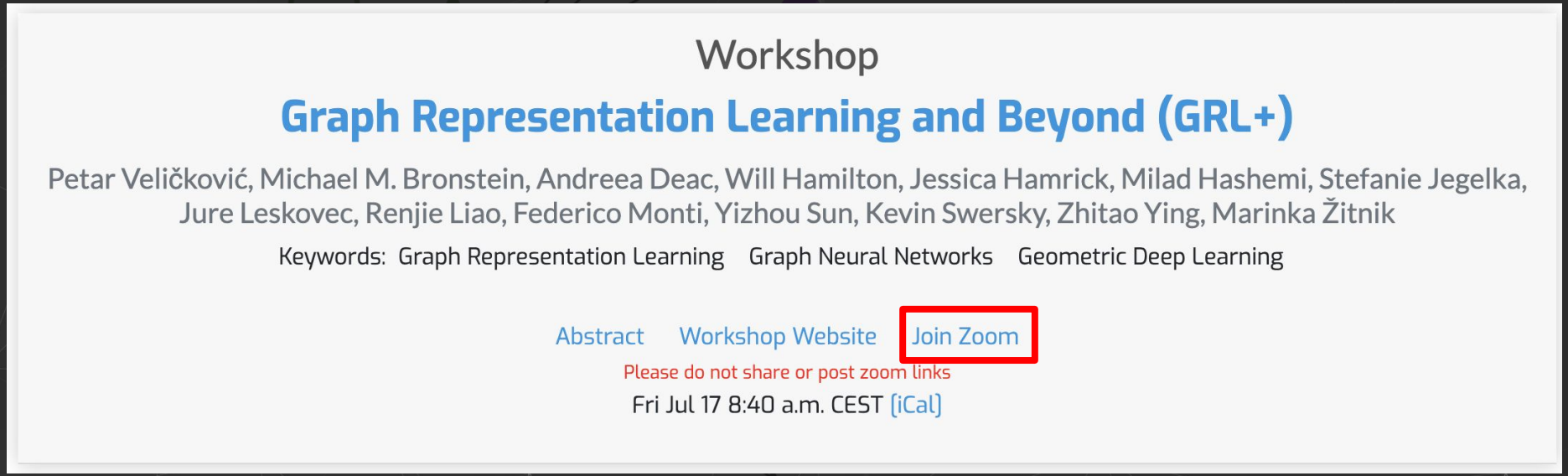
Interacting with the workshop: Livestream

Follow keynote, update and contributed talks live via the **livestream**



Interacting with the workshop: Zoom

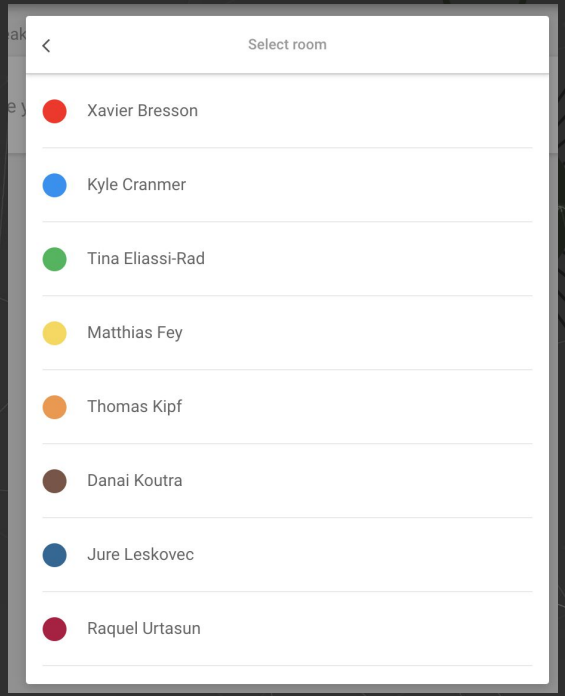
Opening / Closing Remarks, and **Q&A / Discussions** in the main **Zoom**

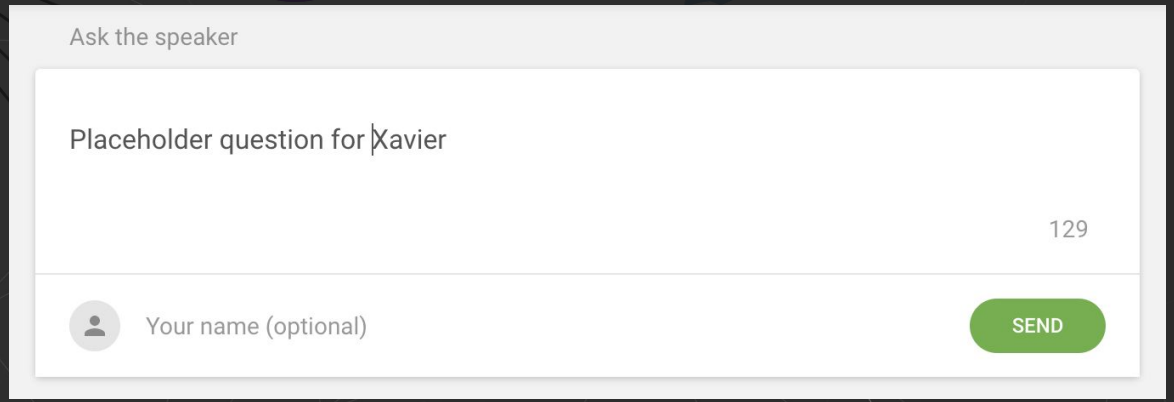


Interacting with the workshop: Slido

For asking / upvoting questions for our keynote speakers, please use **slido**:

https://app.sli.do/event/w45x8xoq

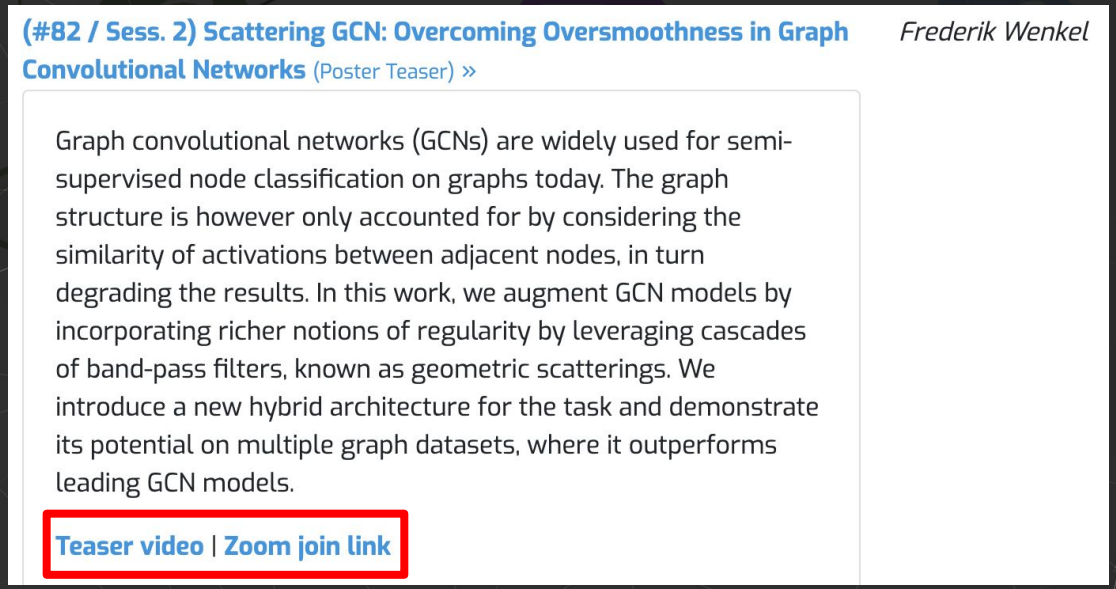




Interacting with the workshop: **Posters**

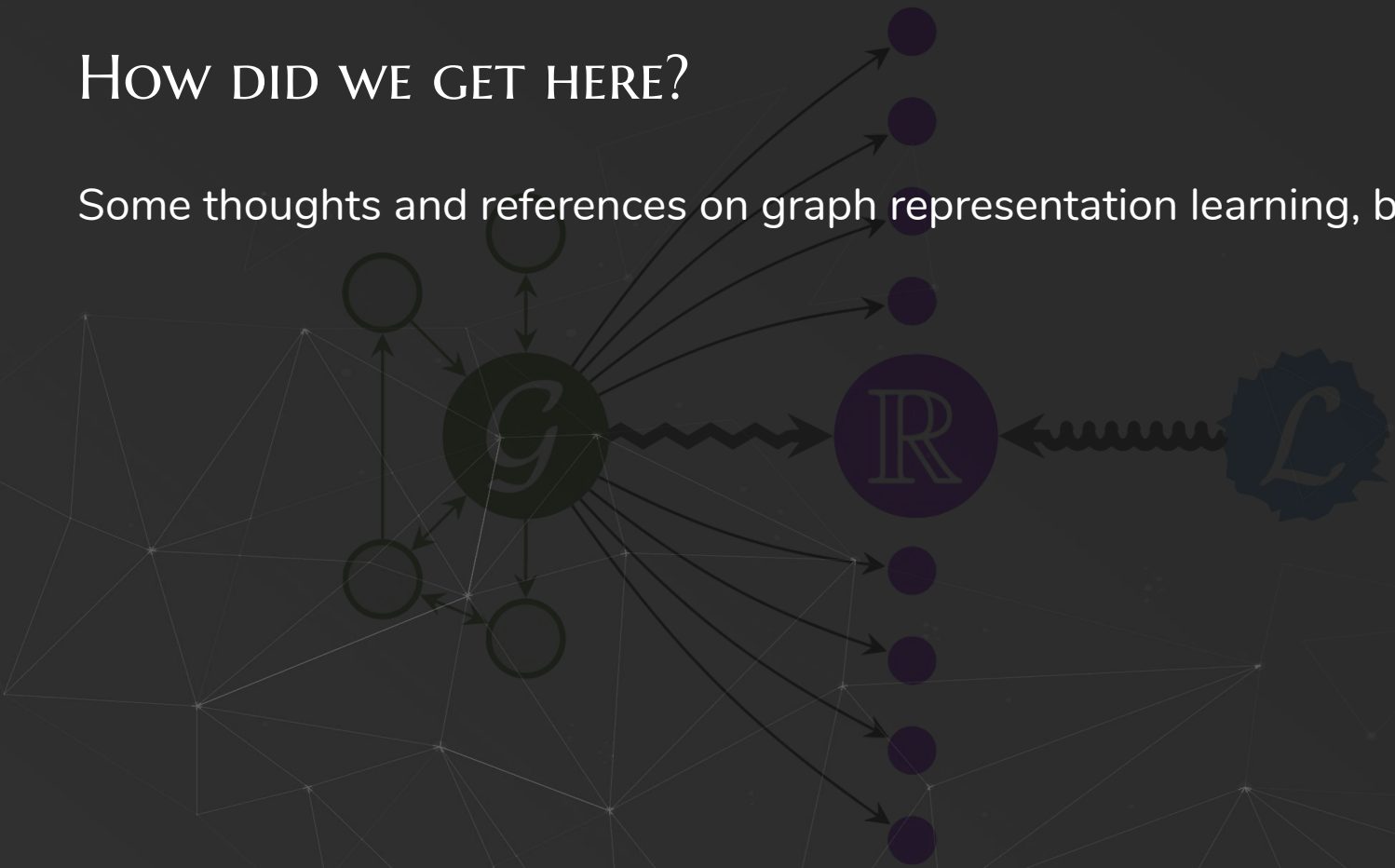
For each accepted paper:

- **Camera-Ready version** & **Session ID**: **https://grlplus.github.io/papers/**
- **Poster Teaser / Link to join Zoom Room**: Virtual Website



How did we get here?

Some thoughts and references on graph representation learning, by Petar



How did we get here?

Embedding techniques on graphs

TransE
Bordes et al., NeurIPS'13

DeepWalk
Perozzi et al., KDD'14

LINE
Tang et al., WWW'15

node2vec
Grover & Leskovec, KDD'16

How did we get here?

Embedding techniques on graphs

Spectral generalisation of image convolutions

Graph Fourier Transform
Bruna et al., ICLR'14

Chebyshev Nets
Defferrard et al., NeurIPS'16

GCNs
Kipf & Welling, ICLR'17

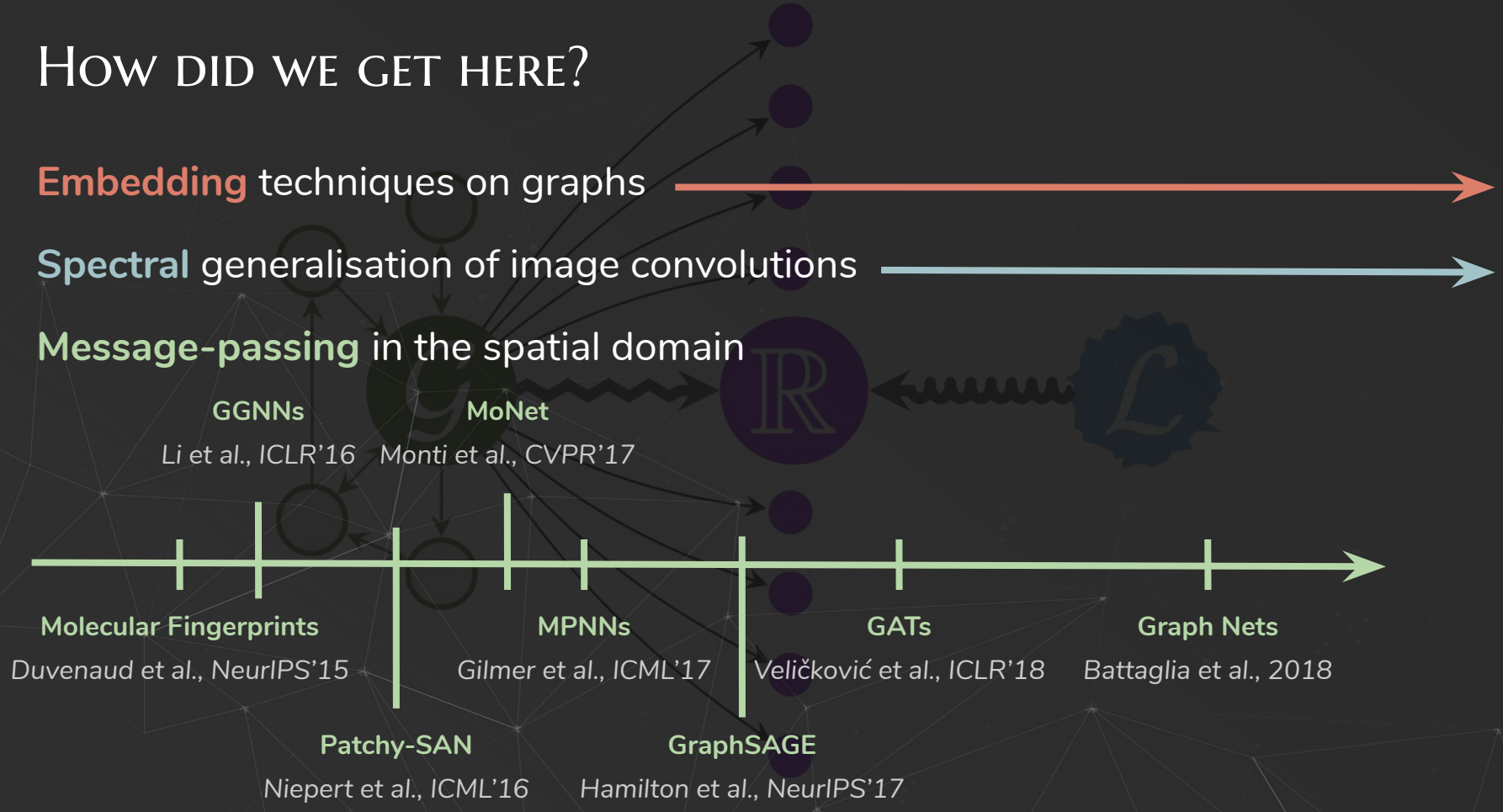
GWNNs
Xu et al., ICLR'19

How did we get here?

Embedding techniques on graphs

Spectral generalisation of image convolutions

Message-passing in the spatial domain



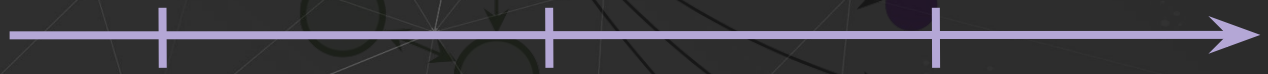
How did we get here?

Embedding techniques on graphs

Spectral generalisation of image convolutions

Message-passing in the spatial domain

Probabilistic Graphical Model concepts



structure2vec
Dai et al., ICML'16

GMNNs
Qu et al., ICML'19

ExpressGNN
Zhang et al., ICLR'20

How did we get here?

Embedding techniques on graphs

Spectral generalisation of image convolutions

Message-passing in the spatial domain

Probabilistic Graphical Model concepts

Graph Isomorphism algorithms

k-GNNs
Morris et al., AAAI'19

GINs
Xu et al., ICLR'19

RP-GIN
Murphy et al., ICML'19

Provably powerful GNNs
Maron et al., NeurIPS'19

How did we get here?

Embedding techniques on graphs

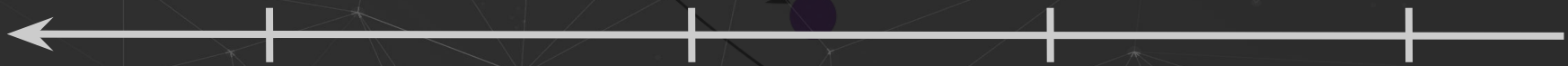
Spectral generalisation of image convolutions

Message-passing in the spatial domain

Probabilistic Graphical Model concepts

Graph Isomorphism algorithms

Historical GRL papers



GNNs

Gori et al., IJCNN'05; Scarselli et al., TNN'07

Recursive NNs

Sperduti & Starita, TNN'97; Frasconi et al., TNN'98

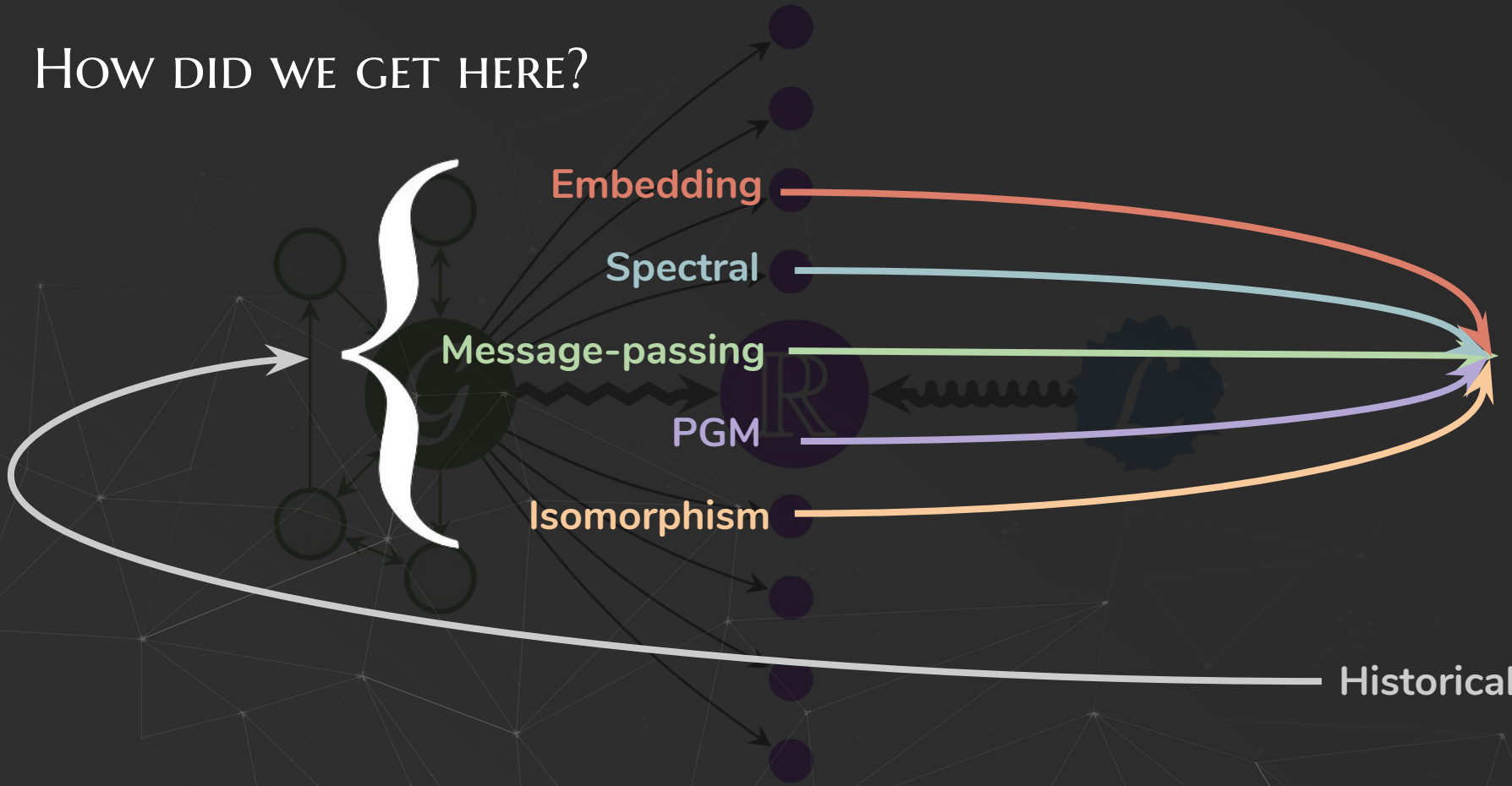
Backprop through structure

Goller & Küchler, ICNN'96

Labeling RAAM

Sperduti, NeurIPS'93

How did we get here?




Thank you!
Enjoy the workshop!