

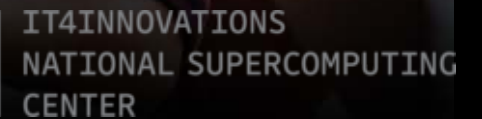
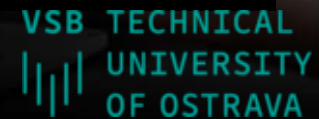


DEEP
LEARNING
INSTITUTE



Accelerated Computing with OpenACC and Deep Learning

27 – 29 April 2021



Overview



- This workshop is co-organised by VSC Vienna, LRZ, IT4Innovations and NVIDIA Deep Learning Institute (DLI).
- NVIDIA Deep Learning Institute (DLI) offers hands-on training for developers, data scientists, and researchers looking to solve challenging problems with deep learning.
- The course combines a lecture about Accelerated Computing with OpenACC with lectures about Fundamentals of Deep Learning for single and for Multi-GPUs.
- Learn how to accelerate your applications with OpenACC, how to train and deploy a neural network to solve real-world problems, and how to effectively parallelize training of deep neural networks on Multi-GPUs.
- The lectures are interleaved with many hands-on sessions using Jupyter Notebooks. The exercises will be done on a fully configured GPU-accelerated workstation in the cloud.



DEEP LEARNING INSTITUTE

DLI Mission: Help the world to solve the most challenging problems using AI and deep learning

We help developers, data scientists and engineers to get started in architecting, optimizing, and deploying neural networks to solve real-world problems in diverse industries such as autonomous vehicles, healthcare, robotics, media & entertainment and game development.

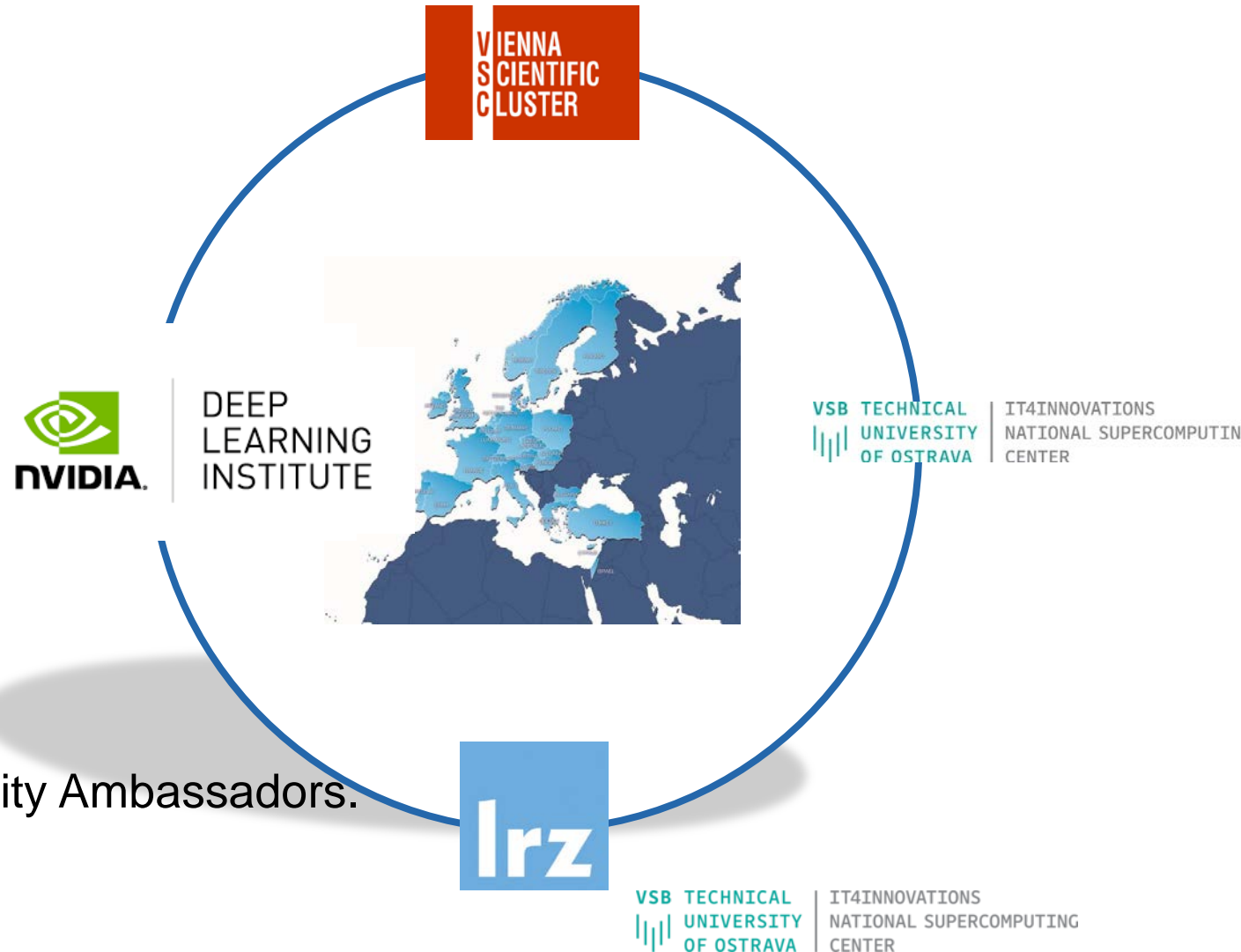
Lecturers



- **Lecturers:**

- PD Dr. Juan Durillo Barrionuevo (LRZ)
- Dr. Volker Weinberg (LRZ)
- Georg Zitzlsberger (IT4Innovations)

All instructors are NVIDIA certified University Ambassadors.



1st day: Fundamentals of Accelerated Computing with OpenACC



- On the 1st day you learn the basics of OpenACC, a high-level programming language for programming on GPUs. Discover how to accelerate the performance of your applications beyond the limits of CPU-only programming with simple pragmas.
- You'll learn:
 - How to profile and optimize your CPU-only applications to identify hot spots for acceleration
 - How to use OpenACC directives to GPU accelerate your codebase
 - How to optimize data movement between the CPU and GPU accelerator
- Upon completion, you'll be ready to use OpenACC to GPU accelerate CPU-only applications.

2nd day: Fundamentals of Deep Learning



- Explore the fundamentals of deep learning by training neural networks and using results to improve performance and capabilities.
- During this day, you'll learn the basics of deep learning by training and deploying neural networks. You'll learn how to:
 - Implement common deep learning workflows, such as image classification and object detection
 - Experiment with data, training parameters, network structure, and other strategies to increase performance and capability
 - Deploy your neural networks to start solving real-world problems
- Upon completion, you'll be able to start solving problems on your own with deep learning.

3rd day: Fundamentals of Deep Learning for Multi-GPUs



- The computational requirements of deep neural networks used to enable AI applications like self-driving cars are enormous. A single training cycle can take weeks on a single GPU or even years for larger datasets like those used in self-driving car research. Using multiple GPUs for deep learning can significantly shorten the time required to train lots of data, making solving complex problems with deep learning feasible.
- On the 3rd day we will teach you how to use multiple GPUs to train neural networks. You'll learn:
 - Approaches to multi-GPUs training
 - Algorithmic and engineering challenges to large-scale training
 - Key techniques used to overcome the challenges mentioned above
- Upon completion, you'll be able to effectively parallelize training of deep neural networks using TensorFlow.

Tentative Agenda Day 1: **Fundamentals of Accelerated Computing with OpenACC**



10:00-10:15 Welcome

10:15-12:00 Intro and Profiling

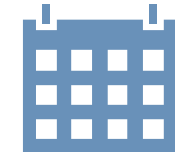
12:00-13:00 Lunch Break

13:00-14:20 OpenACC Directives

14:20-14:30 Coffee Break

14:30-15:45 GPU Programming and Data Management

15:45-16:00 Q&A, Final Remarks



All times are in CEST

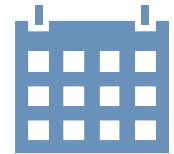
Tentative Agenda Day 2: Fundamentals of Deep Learning



10:00-10:20 Welcome and Intro

10:20-12:00 Introduction to Deep Learning and Convolutional Neural Networks

12:00-13:00 Lunch Break



All times are in CEST

13:00-14:20 Data Augmentation, Deployment and Pre-Trained Models

14:20-14:30 Coffee Break

14:30-15:45 Advanced Architectures

15:45-16:00 Q&A



Tentative Agenda Day 3: **Fundamentals of Deep Learning for Multi-GPUs**



10:00-10:15 Introduction
10:15-12:00 Stochastic Gradient Descent

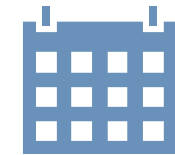
12:00-13:00 Lunch Break

13:00-14:20 Introduction to Distributed Training

14:20-14:30 Coffee Break

14:30-15:45 Algorithmic Challenges of Distributed SGD

15:45-16:00 Q&A



All times are in CEST

Workshop Webpage



- All slides will be made available during the workshop under:

- <https://tinyurl.com/openacc-dl-course-vsc>



- Further information on:

- Agenda
- Training Setup
- Documentation

The screenshot shows a web browser displaying the workshop page. The browser address bar shows the URL: `doku.lrz.de/display/PUBLIC/Accelerated+Computing+with+OpenACC+and+Deep+Learning+@+VSC+Vienna`. The page title is "Accelerated Computing with OpenACC and Deep Learning @ VSC Vienna". The main content area features a large image with logos for lrz, VIENNA SCIENTIFIC CLUSTER, NVIDIA, and DEEP LEARNING INSTITUTE. Below the image, the text reads: "Accelerated Computing with OpenACC and Deep Learning" and "27 - 29 April 2021". The "OVERVIEW" section contains the following text: "Learn how to accelerate your applications with OpenACC, how to train and deploy a neural network to solve real-world problems, and how to effectively parallelize training of deep neural networks on Multi-GPUs. The workshop combines a lecture about Accelerated Computing with OpenACC with lectures about Fundamentals of Deep Learning for single and for Multi-GPUs. The lectures are interleaved with many hands-on sessions using Jupyter Notebooks. The exercises will be done on a fully configured GPU-accelerated workstation in the cloud. The workshop is co-organized by VSC Vienna, LRZ, IT4Innovations and NVIDIA Deep Learning Institute (DLI). NVIDIA DLI offers hands-on training for developers, data scientists, and researchers looking to solve challenging problems with deep learning. All instructors are NVIDIA certified University Ambassadors."

Training Setup



- To get started, follow these steps:
- Create an NVIDIA Developer account at <http://courses.nvidia.com/join> Select "Log in with my NVIDIA Account" and then "Create Account".
- If you use your own laptop, make sure that WebSockets works for you:
Test your Laptop at <http://websocketstest.com>
 - Under ENVIRONMENT, confirm that "WebSockets" is checked yes.
 - Under WEBSOCKETS (PORT 80]. confirm that "Data Receive", "Send", and "Echo Test" are checked yes.
 - If there are issues with WebSockets, try updating your browser.
We recommend Chrome, Firefox, or Safari for an optimal performance.
- Visit <http://courses.nvidia.com/dli-event> and enter the event code provided by the instructor.
- You're ready to get started.

- ZOOM help centre has great resources with help articles and videos for getting started:
<https://support.zoom.us/hc/en-us>.
- You may log in via the app or a browser. We recommend downloading the latest version of the app via <https://zoom.us/download> for the best experience.
- You can participate in the workshop without a ZOOM account. You may sign up for a free account at <zoom.us/signup>.

- Join Zoom Meeting (same link for all 3 days)
<https://us02web.zoom.us/j/84976074798?pwd=Qlg4LzRVZEFVRUs3SnJRYWJQRzZndz09>
Meeting ID: 849 7607 4798
Passcode: 230939

- If you have problems with your computer audio, you can also join by phone:
- Find your local number: <https://us02web.zoom.us/u/kb473v9yas>

00:17:18 Ansicht

Switch between Speaker View / Gallery View / Fullscreen Mode

Teilnehmer (2)

	Volker Weinberg (Ich)		
	Volker Weinberg Backup (Host)		

Einladen Mich stummschalten Host zurückfordern

Un-/Mute

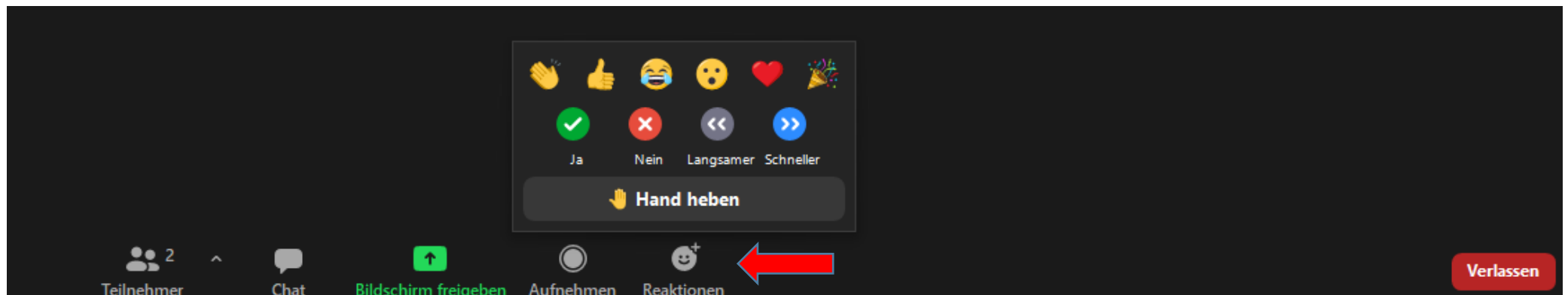
Start video / Select virtual background

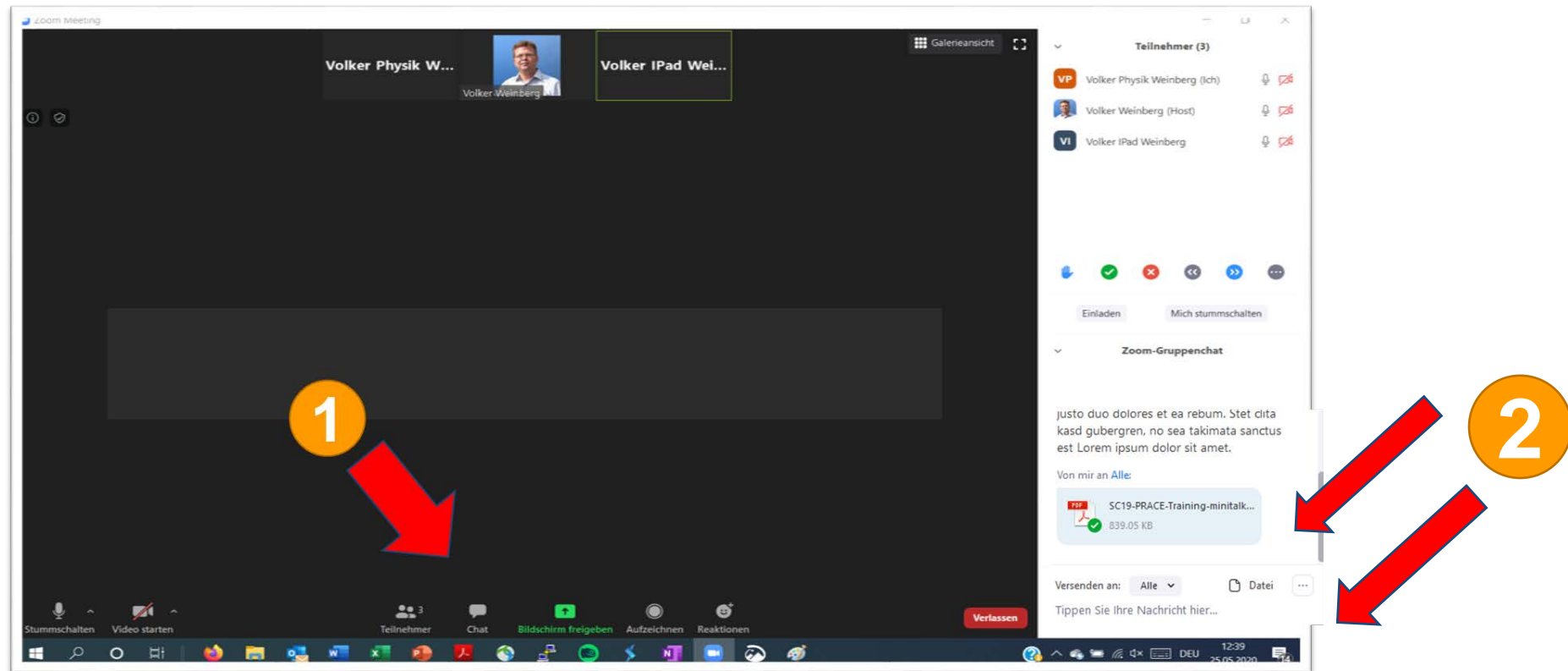
Show Participant list

Stummschalten Video starten Teilnehmer Chat Bildschirm freigeben Aufnehmen Reaktionen Verlassen

Detailed description: This is a screenshot of the Zoom meeting interface. At the top right, there is a timer showing '00:17:18' and a view icon labeled 'Ansicht'. A red arrow points to this area with the text 'Switch between Speaker View / Gallery View / Fullscreen Mode'. In the center, a 'Teilnehmer (2)' window is open, showing a list of participants: 'Volker Weinberg (Ich)' and 'Volker Weinberg Backup (Host)'. Below this window are buttons for 'Einladen', 'Mich stummschalten', and 'Host zurückfordern'. At the bottom, the Zoom control bar is visible. Three red arrows point to specific icons: one to the 'Stummschalten' (mute) icon with the text 'Un-/Mute', one to the 'Video starten' (start video) icon with the text 'Start video / Select virtual background', and one to the 'Teilnehmer' (participants) icon with the text 'Show Participant list'. Other icons in the control bar include 'Chat', 'Bildschirm freigeben', 'Aufnehmen', and 'Reaktionen'. A 'Verlassen' (leave) button is in the bottom right corner.

- **Raise hand** or **use chat window** to ask questions.
- If you do not mind, please **show your video when asking questions** to make this session as interactive as possible.
- **Push to Talk:** The Push to Talk feature allows you to remain muted throughout your Zoom meeting and hold down the spacebar when you want to be unmuted and talk.
- **Instant Feedback:**





And now ...



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Enjoy the course!