

Michael Pitt, Ph.D.

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Education

- 2018 - 2019 **Postdoctoral research fellow**, *Department of particle physics and astrophysics*, Weizmann Institute of Science.
Projects: “Studies of multi-jet QCD events, Particle-Flow using Deep Learning”.
Advisor: Prof. Ehud Duchovni
- 2012 – 2018 **Ph.D.**, *Department of particle physics and astrophysics*, Weizmann Institute of Science.
Thesis title: “Experimental research in particle physics: Characterization of gas-avalanche THGEM particle detector and physics-data analysis with the ATLAS experiment” ([CERN-THESIS-2018-224](#))
Advisors: Prof. Amos Breskin & Prof. Eilam Gross
- 2009 – 2012 **M.Sc.**, *Department of particle physics and astrophysics*, Weizmann Institute of Science.
Thesis title: “Experimental research in particle physics: Detector development and data analysis” ([2012 JINST TH 003](#))
Advisors: Prof. Amos Breskin & Prof. Eilam Gross
- 2006 – 2009 **B.Sc.**, *Bar-Ilan University*, Ramat Gan.
Double major in Physics and Theoretical Mathematics (with honors)
- HEP schools **ESHEP2016** Norway, **EDIT2013** Japan

Professional Experience

- 2018 – 2019 Deep Learning methods for HEP: Particle-Flow algorithm using ATLAS detector’s calorimeter cells [1] and reconstruction charged particles in a dense environment [2]
- 2018 Topological studies of energetic multi-jet QCD events [3]

within the ATLAS collaboration

Performance

- 2012 – 2015 Measurement of the identification efficiency of isolated photons with the “matrix-method” using the ATLAS data [4]. During the 2012 data taking period, identification efficiency of photons became very challenging due to an increase of instantaneous luminosity delivered by the LHC machine. I successfully adjusted the existing algorithm used with the 2011 data to the high pile-up environment. My modifications of the method served ATLAS collaboration till these days [5, 6].

Software

- 2014 – 2018 ATLAS collaboration software: development and maintenance of collaboration tools (PhotonEfficiencyCorrection tool and HIGG6 Derivation Frameworks).

Analysis

- 2015 – 2018 Search for charged Higgs bosons in $\tau\nu$ decay mode. Development and implementation of a robust analysis algorithms, and successful integration with Machine-Learning techniques. Contact editor of the 2015 publication [7], and starting from 2016 I lead the analysis team. During the period of convening the group, we published a conference note [8] and a paper [9].
- 2014 – 2015 Search for associated production of the SM Higgs boson with a top quark pair in multilepton final states [10] with the $\tau\tau$ decay mode. The main result was not only in probing ttH production with the $\tau\tau$ channel but also in testing reconstruction algorithms of the top-quark.
- 2014 Constrains on the off-shell Higgs boson signal strength in the high mass ZZ and WW final states [11]. Validation of Monte-Carlo simulations results of production of the off-shell Higgs boson decaying to VV final states.
- 2011 – 2013 Evidence for the Higgs-boson Yukawa coupling to tau leptons [12]. Development of reconstruction algorithms for di- τ system for the “lep-lep” sub-channel (sub-channel where both τ -leptons decay leptonically) [13]. This method used in the lep-lep channel of the 2014 ATLAS publication of evidence for the Higgs-boson Yukawa coupling.

Radiation detection laboratory

- 2017 – 2018 A phenomenological study of the charging-up processes in gas avalanche particle detectors [14, 15]. Developing a simulation model of gain stability in THGEM-based particle detectors. This model for the first time explained long-term gain variations observed in several types of THGEM-based detectors for many years.
- 2011 – 2017 Test-Beams at CERN, testing novel prototypes for DHCAL at ILC. Contributing in installation, operation and data analysis of Test-Beam results [16, 17, 18, 19]
- 2011 – 2014 Research and development of novel principles of gas-avalanche particle detectors [20]. R&D of a new prototype of THGEM-based detector. The suggested prototype has much stable operation than his ancestors.

Talks

- 2018 “A Toolkit for the simulation of Detector Charging Up/Down”, [RD51 collaboration meeting and the “MPDG Stability” workshop](#), TUM, Munich, Germany
- 2018 “Gain stability and charging-up phenomena in THGEM-based detectors”, [RD51 mini-week](#), CERN
- 2016 “H+ searches in ATLAS, part 1”, [Charged2016](#), Uppsala, Sweden
- 2016 “H+/W \rightarrow $\tau\nu$ searches”, [ATLAS HBSM and EXOT workshop](#), Grenoble, France
- 2014 “Kinematic Reconstruction Techniques”, [HSG8 workshop](#), CERN

Technical Skills

Data analysis: statistical inference, machine learning, statistical modeling, Monte-Carlo simulations (high experience with Madgraph5, Pythia8, PowhegBox)

Computing: MATLAB, C/C++, Python, ML tools (Keras, Tensowflow, PyTorch), Garfield++, ROOT, Inventor, LabView, COMSOL

Hardware experience: Operating gas avalanche detectors – GEM, THGEM.

Language: Hebrew and Russian – native speaker, English – fluent.

Miscellaneous

2000 – 2004 Compulsory military service in IDF

Outreach

I participated in counselling and teaching in various enrichment programs hosted by the Davidson Institute of Science Education (the Education Arm of the Weizmann Institute of Science): The international Science Summer Institute, the ALPHA program for the high school students with intellectual giftedness, the Ma'ale program for excelling Arab Students in Science and Engineering, Computer Science in Academia and Industry, Amos de-Shalit Science Youth camp and the Shalhevet Freier International Physics Tournament.

List of assignments appointments in the Davidson Institute of Science education:

2015 – 2017 A member of admission committee of the “ALPHA” program for the high school students with intellectual giftedness

2015 – 2017 Scientific coordinator of the Dr. Bessie F. Lawrence International Science Summer Institute (ISSI)

References

- [1] E. Duchovni, S. Ganguly, E. Gross, M. Kado, J. Shlomi and M. Pitt, *Implementation of Particle Flow algorithm using Deep Learning techniques, in preparation as ALT-PHYS-INT* .
- [2] WeizmannAI, *TrackML Throughput Phase*, competitions.codalab.org/competitions/20112 .
- [3] D. Turgeman, M. Pitt, I. Roth and E. Duchovni, *On Jet Spatial Distribution in Energetic Multi-jet QCD Events*, *SUBMITTED FOR PUBLICATION* (2019) .
- [4] ATLAS Collaboration, *Measurement of the photon identification efficiencies with the ATLAS detector using LHC Run-1 data*, *Eur. Phys. J. C* **76** (2016) 666.
- [5] ATLAS Collaboration, *Photon identification in 2015 ATLAS data*, Tech. Rep. ATL-PHYS-PUB-2016-014, CERN, Geneva, Aug, 2016.
- [6] ATLAS collaboration, ATLAS Collaboration, *Measurement of the photon identification efficiencies with the ATLAS detector using LHC Run 2 data collected in 2015 and 2016*, *Eur. Phys. J. C* **79** (2019) 205.
- [7] ATLAS Collaboration, *Search for charged Higgs bosons produced in association with a top quark and decaying via $H^\pm \rightarrow \tau\nu$ using pp collision data recorded at $\sqrt{s} = 13$ TeV by the ATLAS detector*, *Phys. Lett. B* **759** (2016) 555.
- [8] ATLAS Collaboration, *Search for charged Higgs bosons in the τ +jets final state using 14.7 fb^{-1} of pp collision data recorded at $\sqrt{s}=13$ TeV with the ATLAS experiment*, Tech. Rep. ATLAS-CONF-2016-088, CERN, Geneva, 2016.
- [9] ATLAS Collaboration, *Search for charged Higgs bosons decaying via $H^\pm \rightarrow \tau^\pm\nu_\tau$ in the τ +jets and τ +lepton final states with 36 fb^{-1} of pp collision data recorded at $\sqrt{s} = 13$ TeV with the ATLAS experiment*, *JHEP* **09** (2018) 139.
- [10] ATLAS Collaboration, *Search for the associated production of the Higgs boson with a top quark pair in multilepton final states with the ATLAS detector*, *Phys. Lett. B* **749** (2015) 519.
- [11] ATLAS Collaboration, *Constraints on the off-shell Higgs boson signal strength in the high-mass ZZ and WW final states with the ATLAS detector*, *Eur. Phys. J. C* **75** (2015) 335.
- [12] ATLAS Collaboration, *Evidence for the Higgs-boson Yukawa coupling to tau leptons with the ATLAS detector*, *JHEP* **04** (2015) 117.
- [13] M. Pitt, *Search for the Standard Model Higgs boson in the $H \rightarrow \tau\tau$ channel with the ATLAS detector*, Tech. Rep. ATL-PHYS-PROC-2013-141, CERN, Geneva, Jun, 2013.
- [14] P. M. M. Correia, M. Pitt, C. D. R. Azevedo, A. Breskin, S. Bressler, C. A. B. Oliveira et al., *Simulation of gain stability of THGEM gas-avalanche particle detectors*, *JINST* **13** (2018) P01015.
- [15] M. Pitt, P. M. M. Correia, S. Bressler, A. E. C. Coimbra, D. Shaked Renous, C. D. R. Azevedo et al., *Measurements of charging-up processes in THGEM-based particle detectors*, *JINST* **13** (2018) P03009.
- [16] S. Bressler, L. Moleri, M. Pitt, S. Kudella, C. Azevedo, F. Amaro et al., *First in-beam studies of a Resistive-Plate WELL gaseous multiplier*, *JINST* **11** (2016) P01005.

- [17] L. Moleri, F. D. Amaro, L. Arazi, C. D. R. Azevedo, E. Oliveri, M. Pitt et al., *The Resistive-Plate WELL with Argon mixtures – A robust gaseous radiation detector*, *Nucl. Instrum. Meth. A* **845** (2017) 262.
- [18] L. Arazi, H. N. da Luz, D. Freytag, M. Pitt, C. D. R. Azevedo, A. Rubin et al., *THGEM-based detectors for sampling elements in DHCAL: laboratory and beam evaluation*, *JINST* **7** (2012) C05011.
- [19] S. Bressler, L. Arazi, H. N. da Luz, C. D. R. Azevedo, L. Moleri, E. Oliveri et al., *Beam studies of novel THGEM-based potential sampling elements for Digital Hadron Calorimetry*, *JINST* **8** (2013) P07017.
- [20] S. Bressler, L. Moleri, L. Arazi, E. Erdal, A. Rubin, M. Pitt et al., *A concept for laboratory studies of radiation detectors over a broad dynamic-range: instabilities evaluation in THGEM-structures*, *JINST* **9** (2014) P03005.
- [21] L. Arazi, M. Pitt, S. Bressler, L. Moleri, A. Rubin and A. Breskin, *Laboratory studies of THGEM-based WELL structures with resistive anode*, *JINST* **9** (2014) P04011.
- [22] S. Bressler, L. Arazi, L. Moleri, M. Pitt, A. Rubin and A. Breskin, *Recent advances with THGEM detectors*, *JINST* **8** (2013) C12012.
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- [27] ATLAS Collaboration, *Search for charged Higgs bosons in the $H^\pm \rightarrow tb$ decay channel in pp collisions at $\sqrt{s} = 8$ TeV using the ATLAS detector*, *JHEP* **03** (2016) 127.
- [28] ATLAS collaboration, ATLAS Collaboration, *Search for neutral MSSM Higgs bosons decaying to $\tau^+\tau^-$ pairs in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector*, *Phys. Lett. B* **705** (2011) 174.