CURRICULUM VITAE

Kaan Şimşek

January, 2025

Personal details

Contact information	Department of Physics & Astronomy Northwestern University Evanston, Illinois 60208, USA	ksimsek@u.northwestern.edu kagsimsek.github.io 0000-0003-1741-8908

Date of birth	September 1, 1991
Place of birth	Tekirdağ, Turkey
Nationality	Turkish
Citizenship	
Languages	

Education

Northwestern University, Evanston, Illinois, USA
Physics, Ph.D. candidate, Aug 2020 – Present
Advisor: Francis John Petriello

University of Rochester, Rochester, New York, USA
Physics, Ph.D. student, Aug 2019 – Aug 2020

Middle East Technical University, Ankara, Turkey
Physics, M.Sc., Feb 2017 – Jul 2019
Dissertation: *Exploring extra dimensions through rare processes*
Advisor: İsmail Turan
Coadvisor: İsmet Yurduşen (Hacettepe University)

Middle East Technical University, Ankara, Turkey
Physics, B.Sc. (double major), Sep 2012 – Feb 2017
Dissertation: *Exploring universal extra dimensions*
Advisor: İsmail Turan

Middle East Technical University, Ankara, Turkey
Civil engineering, B.Sc., Sep 2009 – Feb 2016
Dissertation: *Redesign of METU pedestrian bridge*
Advisor: Alp Caner

Employment

Argonne National Laboratory, Lemont, Illinois, USA
Visiting student
January 2023 – July 2023

Northwestern University, Evanston, Illinois, USA
Graduate student, teaching assistant, research assistant
September 2020 – Present

University of Rochester, Rochester, New York, USA
Teaching assistant
August 2019 – August 2020

Middle East Technical University, Ankara, Turkey
Teaching assistant
October 2017 – August 2019

Middle East Technical University, Ankara, Turkey
Student assistant
October 2016 – June 2017

Asil Proje Teknik Hizmetler Mim. Müh. İnş. Tic. Ltd. Şti., Ankara, Turkey
Civil engineer
August 2015 – September 2015

Arslanlar İnşaat Ticaret ve Turizm Ltd. Şti., Ankara, Turkey
Assistant site chief
August 2013 – September 2013

Eynehan İnşaat Taahhüt Ticaret Ltd. Şti., Ankara, Turkey
Civil engineering intern
June 2011 – September 2011

Research interest

My main field of study is theoretical particle physics. I am profoundly interested in phenomenological studies. My research area includes theories with extra dimensions, physics beyond the Standard Model, top physics, rare processes, QCD, hadron physics, and the Standard Model effective field theory.

Teaching experience

During my graduate years at Northwestern University, I assisted the following courses:

- Undergraduate level

Physics 125-1	General Physics ISP (2021-1) *Graded homework and exam papers; prepared discussion problems; delivered discussion sessions*
Physics 130-3	College Physics (2021-3) *Graded quiz papers; prepared discussion problems; delivered discussion sessions*
Physics 135-2, 3	General Physics (2021-4) *Graded quiz and exam papers; prepared discussion problems; delivered discussion sessions*
Physics 136-2	General Physics Laboratory (2024-1) *Delivered lab sessions; graded lab reports*

- Graduate level

Physics 411-1	Methods of Theoretical Physics (2021-1; 2022-1; 2023-1) *Graded homework and exam papers*
Physics 412-1, 2, 3	Quantum Mechanics (2022-1, 3; 2023-1, 2, 3) *Graded homework and exam papers; delivered discussion sessions*
Physics 416-0	Introduction to Statistical Mechanics (2021-2) *Graded homework papers*

During my graduate year at the University of Rochester, I assisted the following courses:

- Undergraduate level

Physics 113, 114	General Physics I, II (Laboratory) (2019-1, 3) *Prepared lab manual; delivered lab sessions; graded lab report*
Physics 121, 122	Mechanics, Electromagnetism (Laboratory) (2019-1, 3) *Prepared lab manual; delivered lab sessions; graded lab report*
Physics 142	Electricity & Magnetism (Laboratory) (2019-1) *Delivered lab sessions; graded lab reports*
Physics 123	Waves & Modern Physics (2019-2) *Delivered lab sessions; graded lab reports and homework and exam papers; delivered workshops*

During my undergraduate and graduate years at Middle East Technical University, I assisted the following courses:

- Undergraduate level

Physics 105, 106	General Physics I, II (Laboratory) (2016-1, 2; 2017-1, 2, 3; 2018-1, 2) *Delivered lab sessions; graded lab reports and quizzes*
Physics 207	Concepts of Modern Physics (2017-1) *Graded quiz papers*
Physics 407, 408	Particle Physics I, II (2017-1, 2; 2018-2) *Graded homework papers; prepared theoretical recitation hours and quiz and homework problems; delivered lectures; taught shell scripting, Mathematica, FeynArts, FormCalc, Package X, LanHEP, and CalcHEP*

- Graduate level

Physics 507, 508	Quantum Mechanics I, II (2017-1, 2; 2018-1, 2) *Graded homework and exam papers; prepared recitation hours and homework and exam problems; delivered lectures*
Physics 545, 546	Particle Physics I, II (2018-1, 2) *Graded homework and exam papers; prepared recitation hours and exam problems; delivered lectures*

Papers

12 *Transverse spin asymmetries and the electron Yukawa coupling at an FCC-ee*
R. Boughezal, F. Petriello, K. Şimşek
Phys. Rev. D **110** (2024) 075026 | arXiv: 2407.12975 | INSPIRE-HEP: 2808919

11 *SMEFT analysis with LHeC, FCC-eh, and EIC DIS pseudodata*
C. Bissolotti, R. Boughezal, K. Şimşek
arXiv: 2307.09459 | INSPIRE-HEP: 2678210

10 *SMEFT probes in future precision DIS experiments*
C. Bissolotti, R. Boughezal, K. Şimşek
Phys. Rev. D **108** (2023) 075007 | arXiv: 2306.05564 | INSPIRE-HEP: 2667587

9 *Neutral-current electroweak physics and SMEFT studies at the EIC*
R. Boughezal, A. Emmert, T. Kutz, S. Mantry, M. Nycz, F. Petriello, K. Şimşek, D. Wiegand, X. Zheng
Phys. Rev. D **106** (2022) 016006 | arXiv: 2204.07557 | INSPIRE-HEP: 2067965

8 *Snowmass 2021 White Paper: Electron Ion Collider for high energy physics*
R. Abdul Khalek *et al.*
arXiv: 2203.13199 | INSPIRE-HEP: 2057945

7 *Strong coupling constants of charmed and bottom mesons with light vector mesons in QCD sum rules*
T. M. Aliev, K. Şimşek
Phys. Rev. D **104** (2021) 074034 | arXiv: 2107.02735 | INSPIRE-HEP: 1877690

6 *Strong $B^*_{QQ'}B_{QQ'}V$ vertices and the radiative decays of $B^*_{QQ} \to B_{QQ}\gamma$ in the light-cone sum rules*
T. M. Aliev, T. Barakat, K. Şimşek
Eur. Phys. J. A **57** (2021) 160 | arXiv: 2101.10264 | INSPIRE-HEP: 1842668

5 *Strong vertices of doubly heavy spin-3/2 baryon to spin-1/2 baryon with light mesons in light-cone QCD sum rules*
T. M. Aliev, K. Şimşek
Phys. Rev. D **103** (2021) 054044 | arXiv: 2011.07150 | INSPIRE-HEP: 1830522

4 *Gravitational form-factors of the ρ, π, and K mesons in QCD sum rules*
T. M. Aliev, T. Barakat, K. Şimşek
Phys. Rev. D **103** (2021) 054001 | arXiv: 2008.04385, 2009.07926 | INSPIRE-HEP: 1817654

3 *Strong coupling constants of doubly heavy baryons with vector mesons in QCD*
T. M. Aliev, K. Şimşek
Eur. Phys. J. C **80** (2020) 976 | arXiv: 2009.03464 | INSPIRE-HEP: 1815748

2 *Determination of the strong vertices of doubly heavy baryons with pseudoscalar mesons in QCD*
H. I. Alrebdi, T. M. Aliev, K. Şimşek
Phys. Rev. D **102** (2020) 074007 | arXiv: 2008.05098 | INSPIRE-HEP: 1811409

1 *$N^*(1535) \to N$ transition form-factors due to the axial current*
T. M. Aliev, T. Barakat, K. Şimşek
Phys. Rev. D **100** (2019) 054030 | arXiv: 1907.08017 | INSPIRE-HEP: 1744448

Seminars and talks

11 **SMEFT probes in future precision DIS experiments**
New Perspectives 2023, Fermilab, talk, June 27, 2023.

10 **Precision electroweak measurements and SMEFT studies at the EIC**
Phenomenology 2023 Symposium, University of Pittsburgh, talk, May 9, 2023.

9 **Beyond-the-Standard-Model searches at the Large Hadron-electron Collider and the Electron-Ion Collider**
Physics and Astronomy Early Career Research Seminars, Northwestern University, invited talk, April 19, 2023.

8 **Precision electroweak measurements and beyond the Standard Model searches at the Electron-Ion Collider**
DIS2023: XXX International Workshop on DIS and Related Subjects, Michigan State University, invited talk, March 30, 2023.

7 **SMEFT projections at the EIC and LHeC to NLO QCD**
Candidacy talk, Northwestern University, talk, December 2, 2022.

6 **SMEFT projections of neutral-current PVDIS asymmetries at the EIC**
EIC Early Career Workshop 2022, CFNS Stony Brook University and remote, invited talk, July 25, 2022.

5 **SMEFT projections using EIC PVDIS asymmetries**
INT Workshop: Parity-Violation and other Electroweak Physics at JLab 12 GeV and Beyond, remote, invited talk, June 27, 2022.

4 **Neutral-current SMEFT studies at the EIC**
CFNS Workshop: High-Luminosity EIC (EIC Phase II), remote, invited talk, June 21, 2022.

3 **Neutral-Current SMEFT Studies at the EIC**
HEP Seminars, Northwestern University, seminar, April 18, 2022.

2 **Applications of MUED to Rare Top Quark Processes**
2020 GSRM Talks, University of Rochester, talk, February 8, 2020.

1 **Universal Extra Dimensions**
Seminars, Middle East Technical University, seminar, December 6, 2018.

Conferences, workshops, and schools attended

7 *New Perspectives 2023*, Fermilab, Batavia, Illinois, USA, June 26-27, 2023.

6 *Phenomenology 2023 Symposium*, University of Pittsburgh, Pittsburgh, Pennsylvania, USA, May 8-10, 2023.

5 *DIS2023: XXX International Workshop on DIS and Related Subjects*, Michigan State University, East Lansing, Michigan, USA, March 27-31, 2023.

4 *EIC User Group Early Career Workshop 2022*, CFNS Stony Brook University, New York, USA and remote, July 24-25, 2022.

3 *2022 CTEQ Summer School on QCD and Electroweak Phenomenology*, University of Pittsburgh, Pennsylvania, USA, July 6-16, 2022.

2 *INT Workshop: Parity-Violation and other Electroweak Physics at JLab 12 GeV and Beyond*, remote, June 27-July 1, 2022.

1 *CFNS Workshop: High-Luminosity EIC (EIC Phase II)*, remote, June 21-24, 2022.

Certificates

1 *Certificate in Integrated Data Science*
Northwestern Univeristy
Anticipated completion: June, 2025

Awards

3 *The most engaging and fun talk* award
New Perspectives 2023, Fermilab, Batavia, Illinois, USA
June 27, 2023

2 Scholarship covering full tuition and monthly stipend
Northwestern University, Evanston, Illinois, USA
Aug 2020 – Present

1 Scholarship covering full tuition and monthly stipend
University of Rochester, Rochester, New York, USA
Aug 2019 – Jun 2020

Computer skills

- *Programming languages* Mathematica, Python, Fortran, R, C, MATLAB
- *HEP software* FeynArts, FormCalc, LoopTools, FeynCalc, Package X, LanHEP, CalcHEP, LHAPDF, MadGraph
- *Data science and machine learning* NumPy, pandas, matplotlib, autograd, unsupervised and supervised learning, neural networks, regression, classification, dimensional reduction, data visualization
- *Scientific computing* High-performance cluster computing, optimization methods, numerical simulations
- *Tools and platforms* Git, Linux/Unix, Bash/Zsh, TEX, MS Office, Jupyter, Markdown, R Markdown, system administration
- *Other skills* Algorithm design, data wrangling, statistical modeling and analysis

Hobbies

I play the piano, guitar, and pretty much anything I can get my hands on. I also compose and produce music as an independent artist on Spotify. I am a licensed player of the Turkish Chess Federation. I am passionately into cycling, computers, collecting fountain pens, and learning new languages.

References

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