



# CURRICULUM VITAE

Kaan Şimşek  
November, 2024

## Personal details

---

Contact information	Department of Physics & Astronomy Northwestern University Evanston, Illinois 60208, USA	✉ <a href="mailto:ksimsek@u.northwestern.edu">ksimsek@u.northwestern.edu</a> 🌐 <a href="https://github.com/kagsimsek">kagsimsek.github.io</a> 🆔 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

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

- Graduate level

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

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) <i>Prepared lab manual; delivered lab sessions; graded lab report</i>
Physics 121, 122	Mechanics, Electromagnetism (Laboratory) (2019-1, 3) <i>Prepared lab manual; delivered lab sessions; graded lab report</i>
Physics 142	Electricity & Magnetism (Laboratory) (2019-1) <i>Delivered lab sessions; graded lab reports</i>
Physics 123	Waves & Modern Physics (2019-2) <i>Delivered lab sessions; graded lab reports and homework and exam papers; delivered workshops</i>

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

- Undergraduate level

Physics 105, 106	General Physics <a href="#">I</a> , <a href="#">II</a> (Laboratory) (2016-1, 2; 2017-1, 2, 3; 2018-1, 2) <i>Delivered lab sessions; graded lab reports and quizzes</i>
Physics 207	<a href="#">Concepts of Modern Physics</a> (2017-1) <i>Graded quiz papers</i>
Physics 407, 408	Particle Physics <a href="#">I</a> , <a href="#">II</a> (2017-1, 2; 2018-2) <i>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</i>

- Graduate level

Physics 507, 508	Quantum Mechanics <a href="#">I</a> , <a href="#">II</a> (2017-1, 2; 2018-1, 2) <i>Graded homework and exam papers; prepared recitation hours and homework and exam problems; delivered lectures</i>
Physics 545, 546	Particle Physics <a href="#">I</a> , <a href="#">II</a> (2018-1, 2) <i>Graded homework and exam papers; prepared recitation hours and exam problems; delivered lectures</i>

## 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](#)
- 11 *SMEFT analysis with LHeC, FCC-eh, and EIC DIS pseudodata*  
C. Bissolotti, R. Boughezal, K. Şimşek  
[arXiv: 2307.09459](#)
- 10 *SMEFT probes in future precision DIS experiments*  
C. Bissolotti, R. Boughezal, K. Şimşek  
[Phys. Rev. D \*\*108\*\* \(2023\) 075007](#)  
[arXiv: 2306.05564](#)
- 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](#)
- 8 *Snowmass 2021 White Paper: Electron Ion Collider for high energy physics*  
R. Abdul Khalek *et al.*  
[arXiv: 2203.13199](#)
- 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](#)
- 6 *Strong  $B_{QQ'}^* B_{QQ'} V$  vertices and the radiative decays of  $B_{QQ}^* \rightarrow B_{QQ} \gamma$  in the light-cone sum rules*  
T. M. Aliev, T. Barakat, K. Şimşek  
[Eur. Phys. J. A \*\*57\*\* \(2021\) 160](#)  
[arXiv: 2101.10264](#)
- 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](#)
- 4 *Gravitational form-factors of the  $\rho$ ,  $\pi$ , 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](#)

- 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](#)
- 2 *Determination of the strong vertices of doubly heavy baryons with pseudoscalar mesons in QCD*  
H. I. Alrebdī, T. M. Aliev, K. Şimşek  
*Phys. Rev. D* **102** (2020) 074007  
[arXiv: 2008.05098](#)
- 1  *$N^*(1535) \rightarrow N$  transition form-factors due to the axial current*  
T. M. Aliev, T. Barakat, K. Şimşek  
*Phys. Rev. D* **100** (2019) 054030  
[arXiv: 1907.08017](#)

## 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  
Talk (invited)  
April 19, 2023
- 8 **Precision electroweak measurements and beyond the Standard Model searches at the Electron-Ion Collider**  
*DIS2023: XXX International Workshop on Deep-Inelastic Scattering and Related Subjects*  
Michigan State University  
Talk (invited)  
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  
Talk (invited)  
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  
Talk (invited)  
June 27, 2022
- 4 **Neutral-current SMEFT studies at the EIC**  
*CFNS Workshop: High-Luminosity EIC (EIC Phase II)*  
Remote  
Talk (invited)  
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**

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 Deep-Inelastic Scattering 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 University

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**

---

My main tool for computations is MATHEMATICA. I am experienced in HEP packages such as FEYNARTS, FORMCALC, LOOPTOOLS, FEYNALC, PACKAGE X, LANHEP, CALCHEP, LHAPDF, and MADGRAPH, and proficient in  $\text{\LaTeX}$ , shell scripting, Python, C, Fortran, Matlab, R.

## **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

---

### **Takhmasib M. Aliev**

*Professor*

Department of Physics  
Middle East Technical University  
Ankara 06800, Turkey

☎ +90.312.210.5046  
✉ taliev@metu.edu.tr

### **Deborah Anne Brown**

*Assistant Professor of Instruction*

Department of Physics & Astronomy  
Northwestern University  
Evanston, Illinois 60208, USA

☎ +1.847.467.5789  
✉ d-brown4@northwestern.edu

### **Radja Boughezal**

*Physicist*

High Energy Physics Division  
Argonne National Laboratory  
Lemont, Illinois 60439, USA

☎ +1.630.252.6965  
✉ rboughezal@anl.gov  
🌐 hep.anl.gov/rboughezal

*Adjunct Associate Professor*

Department of Physics & Astronomy  
Northwestern University  
Evanston, Illinois 60208, USA

### **John Joseph M. Carrasco**

*Associate Professor*

Department of Physics & Astronomy  
Northwestern University  
Evanston, Illinois 60208, USA

☎ +1.847.467.5080  
✉ carrasco@northwestern.edu  
🌐 fancyphysics.org

### **Anupam Garg**

*Professor*

Department of Physics & Astronomy  
Northwestern University  
Evanston, Illinois 60208, USA

☎ +1.847.491.3229  
✉ agarg@northwestern.edu

### **Pallab Goswami**

*Assistant Professor*

Department of Physics & Astronomy  
Northwestern University  
Evanston, Illinois 60208, USA

☎ +1.847.491.5621  
✉ pallab.goswami@northwestern.edu

### **Francis John Petriello**

*Professor*

Department of Physics & Astronomy  
Northwestern University  
Evanston, Illinois 60208, USA

☎ +1.847.467.3196  
✉ f-petriello@northwestern.edu  
🌐 gate.hep.anl.gov/fpetriello/index.html

### **B. Özgür Sarioğlu**

*Professor*

Department of Physics  
Middle East Technical University  
Ankara 06800, Turkey

☎ +90.312.210.4337  
✉ sarioglu@metu.edu.tr  
🌐 metu.edu.tr/~sarioglu

### **Hande Toffoli**

*Associate Professor,  
Chair Advisor*

Department of Physics  
Middle East Technical University  
Ankara 06800, Turkey

☎ +90.312.210.3264  
✉ ustunel@metu.edu.tr  
🌐 physics.metu.edu.tr/~hande

### **İsmail Turan**

*Professor,  
Vice Chair*

Department of Physics  
Middle East Technical University  
Ankara 06800, Turkey

☎ +90.312.210.5083  
✉ ituran@metu.edu.tr  
🌐 metu.edu.tr/~ituran