

# Soner Albayrak

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## ACADEMIC POSITIONS

### Middle East Technical University, Ankara, Turkey

Doktor Öğretim Üyesi (Assistant Professor)

Oct 2023 - present

Ek Görevli Öğretim Görevlisi (Part Time Lecturer)

Sep 2023 - Oct 2023

### University of Amsterdam, Amsterdam, Netherlands

Onderzoeker (Researcher)

Sep 2021 - Sep 2023

(Contact: Daniel Baumann)

### National Taiwan University, Taipei, Taiwan

Visiting Researcher

Apr 2023 - Jun 2023

(Contact: Yu-tin Huang)

## ACADEMIC AND PROFESSIONAL PREPARATION

### Yale University, New Haven, USA

Doctor of Philosophy in Physics

Aug 2016 - Jun 2021

(Advisor: David Poland)

Dissertation title: *Analytic Studies of Fermions in the Conformal Bootstrap*

Master of Philosophy in Physics

Master of Science in Physics

### California Institute of Technology, Pasadena, USA

Visiting Student Researcher

Jul 2018 - Jun 2019

(Host: David Simmons Duffin)

Simons Bootstrap Collaboration Graduate Student Exchange

### Middle East Technical University, Ankara, Turkey

Master of Science in Physics

Sep 2008 - Feb 2016

(Advisor: İsmail Turan)

Thesis: *A Lorentz Violating Theory: Its Nonminimal Extension in the Photon Sector*

Bachelor of Science in Physics

Bachelor of Science in Electrical & Electronics Engineering

## CURRENT RESEARCH INTERESTS

Conformal bootstrap

AdS/CFT

Cosmological bootstrap

Scattering amplitudes

## PEER REVIEWED PUBLICATIONS

**S. Albayrak** and S. Kharel, *Soft limits of gluon amplitudes in holography and cosmology*, [JHEP 07 \(2025\) 019](#)

**S. Albayrak**, S. Kharel and X. Wang, *Momentum-space formulae for AdS correlators for diverse theories in diverse dimensions*, [JHEP 07 \(2024\) 281](#)

**S. Albayrak**, P. Benincasa and C. D. Pueyo, *Perturbative unitarity and the wavefunction of the Universe*, [SciPost Phys. 16, 157 \(2024\)](#)

**S. Albayrak** and S. Kharel, *All plus four point (A)dS graviton function using generalized on-shell recursion relation*, [JHEP 05 \(2023\) 151](#)

**S. Albayrak**, Rajeev Erramilli, Zhijin Li, David Poland and Yuan Xin, *Bootstrapping  $N_f = 4$  conformal QED<sub>3</sub>*, [Phys.Rev.D 105 \(2022\)](#)

- S. Albayrak**, S. Kharel and D. Meltzer, *On duality of color and kinematics in (A)dS momentum space*, [JHEP 03 \(2021\) 249](#)
- S. Albayrak** and S. Kharel, *Spinning loop amplitudes in Anti-de Sitter space*, [Phys.Rev.D 103 \(2021\) 2](#)
- S. Albayrak**, C. Chowdhury and S. Kharel, *On loop celestial amplitudes for gauge theory and gravity*, [Phys.Rev.D 102 \(2020\)](#)
- S. Albayrak**, D. Meltzer and D. Poland, *The Inversion Formula and 6j Symbol for 3d Fermions*, [JHEP 09 \(2020\) 148](#)
- S. Albayrak**, C. Chowdhury and S. Kharel, *Study of momentum space scalar amplitudes in AdS spacetime*, [Phys.Rev.D 101 \(2020\) 12](#)
- S. Albayrak** and S. Kharel, *Towards the higher point holographic momentum space amplitudes. Part II. Gravitons*, [JHEP 12 \(2019\) 135](#)
- S. Albayrak**, C. Chowdhury and S. Kharel, *New relation for Witten diagrams*, [JHEP 10 \(2019\) 274](#)
- S. Albayrak**, D. Meltzer and D. Poland, *More Analytic Bootstrap: Nonperturbative Effects and Fermions*, [JHEP 08 \(2019\) 040](#)
- S. Albayrak** and S. Kharel, *Towards the higher point holographic momentum space amplitudes*, [JHEP 02 \(2019\) 040](#)

## TEACHING EXPERIENCE

|  |                                |
|--|--------------------------------|
| <b>Instructor</b> , Middle East Technical University         | 2023-current                   |
| PHYS 778: <i>Bootstrap Methods in Theoretical Physics II</i> | Spring '24                     |
| PHYS 777: <i>Bootstrap Methods in Theoretical Physics I</i>  | Fall '24                       |
| PHYS 210: <i>Mathematical Methods in Physics II</i>          | Spring '23, '24                |
| PHYS 209: <i>Mathematical Methods in Physics I</i>           | Fall '23, '24                  |
| PHYS 106: <i>General Physics II</i>                          | Spring '23                     |
| PHYS 105: <i>General Physics I</i>                           | Fall '23                       |
| <b>Teaching Assistant</b> , Yale University                  | 2017-2021                      |
| PHYS 181: <i>University Physics</i>                          | Spring '18, '20, '21           |
| PHYS 180: <i>University Physics</i>                          | Fall '17, '19, '20; Summer '20 |
| PHYS 166L: <i>General Physics Laboratory</i>                 | Spring '17                     |
| <b>Teaching Assistant</b> , Middle East Technical University | 2014-2016                      |
| PHYS 502: <i>Analytical Mechanics</i>                        | Fall '15; Spring '16           |
| PHYS 408: <i>Particle Physics II</i>                         | Spring '15, '16                |
| PHYS 407: <i>Particle Physics I</i>                          | Fall '14, '15                  |
| PHYS 311: <i>Classical Mechanics</i>                         | Fall '14, '15; Spring '15, '16 |
| PHYS 105 - LAB: <i>General Physics I</i>                     | Fall '14                       |

## AWARDS, HONORS, SCHOLARSHIPS, AND FELLOWSHIPS

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|---|-----------|
| The Science Academy Young Scientist Award (BAGEP 2024)<br><i>Durmuş Ali Demir Anısına BAGEP Anı Ödülü</i>                   | Apr 2024  |
| International Fellowship for Early Stage Researchers Program (TÜBİTAK 2232b)  | Oct 2023  |
| Graduate Courses Performance Award<br><i>by Middle East Technical University</i>  | Apr 2015  |
| National Graduate Study Scholarship<br><i>by Scientific and Technological Research Council of Turkey</i>                    | Oct 2014  |
| Dean's Honor and High Honor Lists   | 2009-2013 |
| Outstanding Success Scholarship's<br><i>by METU, by Turkish Educational Foundation, and by Ministry of Youth and Sports</i> | Aug 2008  |

## CONFERENCES & PRESENTATIONS

|   |          |
|---|----------|
| Departmental Seminar, Bilkent University - Ankara<br>Invited Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i>   | Apr 2025 |
| 1.Fizik ve Felsefe Çalıştayı, İstanbul University<br>Talk: <i>Şu Fiziği indirgeyip de mi kuramlasak yoksa indirgemeyip de mi kuramlasak?</i>  | Apr 2025 |
| 4. ODTÜ Fizik Topluluğu Çalıştayı, METU - Ankara<br>Invited Talk: <i>Teorik Fizikteki Problemler</i>  | Mar 2025 |
| Departmental Seminar, Bosphorus University - İstanbul<br>Invited Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i>   | Feb 2025 |
| A life dedicated to theoretical physics: in memory of Durmuş Ali Demir, Sabancı University - İstanbul<br>Invited Talk: <i>A geometric approach to the perturbative unitarity in cosmology</i> | Feb 2025 |
| StarFin 2024 Bilim Kongresi, online seminar<br>Invited Talk: <i>Teorik Fizikteki Problemler</i>   | Dec 2024 |
| Bootstrap 2024, Complutense University  | Jul 2024 |
| Yüksek Enerji Fiziği Çalıştayı (YEFİST 2024), İstanbul University - İstanbul<br>Talk: <i>Problems in Theoretical Physics</i>  | May 2024 |
| 21 <sup>th</sup> Workshop on Quantization, Dualities and Integrable Systems, online seminar<br>Talk: <i>Perturbative Unitarity and the Wavefunction of the Universe</i>                       | Apr 2024 |
| Astronomi ve Fizik Günleri, Bosphorus University - İstanbul<br>Invited Talk: <i>Problems in Theoretical Physics</i>   | Apr 2024 |
| Conformal Bootstrap Annual Meeting, Simons Foundation - New York  | Nov 2023 |
| Fuzzy Sphere Meets Bootstrap, SCGP-Stony Brook  | Nov 2023 |
| Bootstrap 2023, ICTP – SAIFR  | Jul 2023 |
| National Taiwan University, seminar<br>Invited Talk: <i>A geometric approach to the perturbative unitarity in cosmology</i>   | May 2023 |
| Middle East Technical University, seminar<br>Invited Talk: <i>Extending the flat space techniques to curved spacetimes</i>  | Mar 2023 |

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|---|----------|
| University of Amsterdam String Theory Journal Club<br>Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i>  | Feb 2023 |
| Positivity, Princeton Center for Theoretical Science  | Dec 2022 |
| Bootstrapping Nature, Galileo Galilei Institute<br>Invited Talk: <i>Inverting the 3d Fermions</i>   | Nov 2022 |
| ATITPhysics 2022S, online school<br>Colloquium: <i>Problems in Theoretical Physics</i>  | Sep 2022 |
| Middle East Technical University, online seminar<br>Invited Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i>                                    | Jun 2022 |
| 20 <sup>th</sup> Workshop on Quantization, Dualities and Integrable Systems, online seminar<br>Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i> | Apr 2022 |
| Holography@D-ITP meetings, Utrecht University<br>Invited Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i>                                       | Apr 2022 |
| Case Western Reserve University, online seminar<br>Invited Talk: <i>Conformal QED in 3d: The Numerical Bootstrap Approach</i>                                     | Apr 2022 |
| Boundaries and Defects in CFT and Holography, online school   | Mar 2022 |
| Conformal Bootstrap Annual Meeting, Simons Foundation - New York  | Nov 2021 |
| ICTP – School on Superstring Theory and Related Topics, online school   | Oct 2021 |
| University of Amsterdam String Theory Journal Club<br>Talk: <i>Fermions in CFTs: The Analytic Bootstrap Approach</i>  | Oct 2021 |
| International Society for Quantum Gravity, online meeting   | Oct 2021 |
| All Lambdas Holography @ Prague, online workshop  | Oct 2021 |
| ATITPhysics 2021, online school<br>Lecture Series: <i>Conformal Symmetry in Field Theories</i>  | Sep 2021 |
| Bootstrap 2021, online conference   | Jul 2021 |
| 19 <sup>th</sup> Workshop on Quantization, Dualities and Integrable Systems, online seminar<br>Talk: <i>Fermions in CFTs: The Analytic Bootstrap Approach</i>     | Apr 2021 |
| THK University, online seminar<br>Invited Talk: <i>Simetriler: Niçin evrenimiz böyle?</i>   | Mar 2021 |
| Porto University, online seminar<br>Invited Talk: <i>On Witten diagrams in momentum space</i>   | Feb 2021 |
| Bootstrap 2020, online conference   | Jun 2020 |
| Middle East Technical University, online seminar<br>Invited Talk: <i>Recent Developments in Conformal Bootstrap</i>   | Nov 2020 |
| Zoomplitudes 2020, online conference  | May 2020 |
| Online seminar series in theoretical physics in Turkey<br>Talk: <i>Recent Developments in Conformal Bootstrap</i>   | May 2020 |
| Conformal Bootstrap Annual Meeting, Simons Foundation - New York  | Nov 2019 |
| Developments in the Numerical Bootstrap, SCGP-Stony Brook   | Nov 2019 |
| Bootstrap 2019, Perimeter Institute   | Jul 2019 |

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|---|----------|
| Bootstrap 2018, California Institute of Technology                            | Jul 2018 |
| Analytic approaches to the bootstrap, Azores                                  | May 2018 |
| Particle theory group student talk: <i>On Wess-Zumino-Witten model</i> , Yale | Mar 2018 |
| Signals for Nonminimal Lorentz and CPT Violation, IUCSS                       | Jun 2015 |
| Poster presentation: <i>CPT-odd Photon in Vacuum-Orthogonal Model</i>         |          |
| Ankara High Energy Physics Days, METU   | Feb 2015 |
| Talk: <i>CPT Violating QED and Beyond</i>                                     |          |
| Recent Developments in High Energy Physics, METU                              | May 2013 |

## OTHER ACTIVITIES

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### Active

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| Referee, <i>Turkish Journal of Physics</i>     | 2024-current |
| Referee, <i>Journal of High Energy Physics</i> | 2023-current |

### Past

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|---|----------------|
| Organizer, <i>BOĞAZİÇİ-METU-OSTIMTECH Feza Gürsey Commemoration Day</i>   | 2025           |
| Member, <i>University Forum (UVA)</i><br><i>served on the representative group for postdoctoral researchers</i>                         | 2022-2023      |
| Organizer, <i>ATITPhysics Online School Series</i>  | 2021-2022      |
| Advising Committee, <i>Joint Seminar Series (Boun&amp;METU&amp;UTAA)</i>  | 2021-2022      |
| Physics Outreach (in Turkish), <i>Evrin Ağacı</i>   | 2017-2018      |
| Electrical & Electronics Engr. Intern, PROMOD R&D Software, Ankara<br><i>worked for object tracking and camera calibration problems</i> | Jul & Aug 2013 |
| Electrical & Electronics Engr. Intern, SÖKTAŞ Textile, Aydın<br><i>worked in the control department</i>                                 | Aug & Sep 2012 |

## REFERENCES

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Available upon request