Curriculum Vitae
Albi Kerbizi

Personal Information

Name: Albi Kerbizi
Nationality: Albanian, Italian
Born in: Kryevidh, Kavaje (AL)
Spoken languages: Italian (mother tongue), Albanian (mother tongue), English (advanced), German (basic)

Presently I am a fixed term Researcher at the University of Trieste. From 2020 till 2022 I was employed by the Italian National Institute of Nuclear Physics (INFN) as Research Fellow and was based in the Trieste Section of the Institute. My main research activity concerns the study of the spin effects in the strong interactions, in particular the modelling of the quark spin effects in the hadronization process and the simulation using Monte Carlo event generators. I am also a member of the COMPASS experiment at CERN, where I study the three-dimensional structure of the nucleons by analyzing (un)polarized semi-inclusive deep inelastic scattering data, a CERN user, and associated to the activities of INFN.

Professional Experience

- 20/12/2022 – present: **Researcher** (RTDA) at the Trieste University, Trieste, Italy.
- 01/03/2022 – 19/12/2022: **Research Fellow** at the Trieste Section of INFN, Trieste, Italy
- 17/10/2022 – 19/12/2022: **Teaching Assistant** in the Laboratory II course (part "Statistical analysis of experimental data") of the Bachelor's degree in Physics, Department of Physics, Trieste University
- 03/02/2020 – 02/02/2022: **Research Fellow** at Trieste Section of INFN, Trieste, Italy
- 15/11/2021 – 21/01/2022: **Teaching Assistant** in the Laboratory II course (part "Statistical analysis of experimental data") of the Bachelor's degree in Physics, Department of Physics, Trieste University
- 18/11/2020 – 19/01/2021: **Teaching Assistant** in the Laboratory II course (part "Statistical analysis of experimental data") of the Bachelor's degree in Physics, Department of Physics, Trieste University
- 15/11/2019 – 17/01/2020: **Teaching Assistant** in the Laboratory II course (part "Statistical analysis of Experimental data") of the Bachelor's degree in Physics, Department of Physics, Trieste University

Scientific Positions held

- Since 2020: **Member** of the National Institute of Physics (NIP), Tirana, Albania
- Since 2016: **Member** of the COMPASS Collaboration, CERN
- Since 2016: **CERN user**
- Since 2016: **Associated** to the activities of the INFN

My research in COMPASS

My contribution to the activities of the COMPASS experiment started within the Trieste group in 2015. Along the years I contributed to the analysis of the (un)polarized semi-inclusive deep inelastic scattering (SIDIS) process and to the phenomenological interpretation of the results, including the interpretation of transverse spin effects in SIDIS off polarized protons and deuterons using MC simulations, the measurement of transverse spin asymmetries for ρ^0 mesons produced in SIDIS off transversely polarized protons, the correction of the azimuthal asymmetries in unpolarized SIDIS for the contribution of diffractive processes and their interpretation using MC simulations. I also contributed to proposal for the COMPASS 2022 deuteron run pushed forward by the Trieste group, by studying the impact of proposed data taking to the extraction of the transversity parton distribution function for valence u and d quarks (employing the replica method). On behalf of the COMPASS Collaboration, I participated to the writing of

different articles (one as corresponding author), presented the analysis results in international conferences, wrote conference proceedings and internal release notes.

Education

- 01/11/2016 – 05/03/2020: **Doctorate in Physics**, University of Trieste, Trieste, Italy

The title of the thesis was *Recursive fragmentation of a polarized quark,* with supervisors Prof. A. Martin (Trieste University and INFN) and Prof. X. Artru (IP2I, Lyon). I was awarded the Ph.D on March 5th 2020 with the final grade *summa cum laude*.

- 18/09/2014 – 19/09/2016: **Master's degree in Theoretical Physics**, University of Trieste, Trieste, Italy

The title of the thesis was *Study of the fragmentation process of transversely polarized quarks,* with supervisors Prof. A. Martin and Prof. X. Artru. I was awarded the master's degree on September 9th 2016 with the final grade *summa cum laude* (110/110L).

- 20/07/2011 – 21/07/2014: **Bachelor's degree in Physics**, University of Trieste, Trieste, Italy

The title of the thesis title was *Impulso trasverso dei quark* (Transverse momentum of quarks) with supervisor Prof. A. Martin. I was awarded the bachelor's degree on July 21st 2014 with the final grade *summa cum laude* (110/110L).

Prizes and awards

- 04/04/2023: **Seal of Excellence** for the project proposal "SPINFRAG: Spin-dependent string fragmentation", submitted under the Horizon Europe Marie Skłodowska-Curie Actions, call "HORIZON-MSCA-2022-PF-01-01 - MSCA Postdoctoral Fellowships 2022".
- 23/10/2022: **Awardee of the "Young Researchers – Seal of Excellence"** program called by the Italian Ministry of University and Research (MUR). Consequently, I was called as a fixed term Researcher (RTDA L. 240/2010, SC 02/A1, SSD FIS/01) by the University of Trieste.
- 05/05/2022: **Seal of Excellence** for the project proposal "SPINFRAG: Spin-dependent fragmentation", submitted under the Horizon Europe Marie Skłodowska-Curie Actions, call "HORIZON-MSCA-2021-PF-01-01 - MSCA Postdoctoral Fellowships 2021".
- 30/08/2016 – 05/03/2020: **Doctoral Fellowship** at University of Trieste.
- 24/03/2017: Master's **thesis award** by Fondazione Zanolin Dametto.

Projects and Funding

Funded projects:

20/12/2022 – present: **Principal Investigator** of the project "POLFRAG: Simulation of polarized quark fragmentation and application to the investigation of the nucleon structure", CUP n. J97G22000510001, funded by the Italian Ministry of University and Research (MUR) within the program "Young Researchers – Seal of Excellence".

Proposed projects:

- 14/09/2022: **MSCA Postdoctoral Fellowship proposal** "SPINFRAG: Spin-dependent string fragmentation" dedicated to the understanding of the spin effects in the strong interactions. Submitted under HORIZON-MSCA-2022-PF-01-01 with the Lund University as Host Institution.
- 12/10/2021: **MSCA Postdoctoral Fellowship proposal** "SPINFRAG: Spin-dependent fragmentation" dedicated to the understanding of the spin effects in the strong interactions. Submitted under HORIZON-MSCA-2021-PF-01-01 with the Lund University as Host Institution. The project was not funded due to lack of funding.

Membership in other projects:

- 01/06/2019 – 31/05/2023: **Member of the project** STRONG-2020, "*WP22_JRA4 3D structure of the nucleon in the momentum space TMD-neXt*". Scientific responsible Prof. A. Bressan (University of Trieste, INFN Trieste).
- 01/01/2018 – 31/12/2021: **Member of the project** FRA2018 - "*Determination of the intrinsic quark tranverse momentun from unpolarised SIDIS*". Scientific responsible Prof. A. Bressan (University of Trieste, INFN Trieste).

- 01/10/2017 – 30/09/2018: **Member of the project** Laboratory Directed Research & Development project, "*Phenomenological Study Of Hadronization In Nuclear And High-energy Physics Experiments"*. Scientific responsible: Dr. Markus Diefenthaler (Jefferson Lab), Prof. Ted Rogers (Jefferson Lab, Old Dominion University), and Dr. Wally Melnitchouk (Jefferson Lab).
- 01/01/2016 – 10/04/2018: **Member of the project** FRA2015 -"*Misura della trasversità nel processo SIDIS*". Scientific responsible Prof. A. Martin (University of Trieste, INFN Trieste).

Supervising and mentoring activities

- October 2018 – January 2019: **Teaching Assistant** in the Laboratory II course (part "Statistical analysis of experimental data") of the bachelor's degree in Physics, Department of Physics, Trieste University
- October 2017 – January2018: **Teaching Assistant** in the Laboratory II course (part "Statistical analysis of experimental data") of the bachelor's degree in Physics, Department of Physics, Trieste University

List of Publications

Peer-reviewed journals

1. A. Kerbizi and L. Lönnblad, *Extending StringSpinner to handle vector-meson spin*, Comput. Phys. Commun. **292** (2023) 108886.
2. G. D. Alexeev et al. (COMPASS Collaboration), *Collins and Sivers transverse-spin asymmetries in inclusive muoproduction of* ρ^0 *mesons*, Phys. Lett. B **843** (2023) 137950 (A. Kerbizi co-corresp. author).
3. A. Kerbizi, X. Artru, and A. Martin, *Production of vector mesons in the string+*$^3P_0$ *model of polarized quark fragmentation*, Phys. Rev. **D 104** (2021), 114038
4. A. Kerbizi and L. Lönnblad, *StringSpinner – adding spin to the PYTHIA string fragmentation*, Comput. Phys. Commun., **272** (2022) 108234
5. A. Kerbizi, X. Artru, Z. Belghobsi and A. Martin, *Simplified recursive* $^3P_0$ *model for the fragmentation of polarized quarks*, Phys. Rev. **D 100** (2019), no.1, 014003
6. A. Kerbizi, X. Artru, Z. Belghobsi, F. Bradamante and A. Martin, *Recursive model for the fragmentation of polarized quarks*, Phys. Rev. **D 97** (2018) no.7, 074010
7. V. Barone, F. Bradamante, A. Bressan, A. Kerbizi, A. Martin, A. Moretti, J. Matousek, G. Sbrizzai, *Transversity distibutions from difference asymmetries in semi-inclusive DIS*, Phys. Rev. **D 99** (2019) no.11, 114004
8. COMPASS Collaboration, *Collins and Sivers transverse-spin asymmetries in inclusive muoproduction of* ρ^0 *mesons*, CERN-EP-2022-234, e-Print: 2211.00093 (accepted for publication by Phys. Lett. B, I am one of the corresponding authors)
9. J. Agarwala et al. (COMPASS collaboration), *Contribution of exclusive diffractive processes to the measured azimuthal asymmetries in SIDIS*, Nucl. Phys. **B 956** (2020) 115039
10. G. D. Alexeev et al. (COMPASS Collaboration), *Transverse-spin-dependent azimuthal asymmetries of pion and kaon pairs produced in muon-proton and muon-deuteron semi-inclusive deep inelastic scattering,* Phys. Lett. B **845** (2023) 138155.
11. G. D. Alexeev et al. (COMPASS Collaboration), *Double* J/ψ *production in pion-nucleon scattering at COMPASS,* Phys. Lett. **B 838** (2023) 137702.
12. M. G. Alexeev et al. (COMPASS collaboration), *Probing transversity by measuring* Λ *polarisation in SIDIS,* Phys. Lett. **B 824** (2022) 136834
13. M. G. Alexeev et a. (COMPASS collaboration), *The exotic meson* $\pi_1(1600)$ *with* $J^{PC} = 1^{-+}$ *and its decay into* $\rho(770)\pi$, Phys. Rev. **D 105** (2022) 1, 012005
14. M. G. Alexeev et a. (COMPASS collaboration), *Spin density matrix elements in exclusive* ω *meson muoproduction*, Eur. Phys. J. **C 81** (2021) 2, 126
15. M. G. Alexeev et a. (COMPASS collaboration), *A triangle singularity as the origin of the* $a_1(1420)$, Phys. Rev. Lett. **127** (2021) 8, 082501
16. M. G. Alexeev et al. (COMPASS collaboration), *Antiproton over proton and* K^- *over* K^+ *multiplicity ratios at high z in DIS*, Phys. Lett. **B 807** (2020) 135600
17. M. G. Alexeev et al. (COMPASS collaboration), Measurement of the cross section for hard exclusive π^0 *leptoproduction*, Phys. Lett. **B 805** (2020) 135454
18. M. G. Alexeev et al. (COMPASS collaboration), *Measurement of* P_T*-weighted Sivers asymmetries in leptoproduction of hadrons*, Nucl. Phys. **B 940** (2019) 34-53

19. M. Aghasyan et al. (COMPASS collaboration), Light isovector resonances in $\pi^- p \to \pi^- \pi^- \pi^+$ at 190 GeV/c, Phys. Rev. **D 98**, 092003 (2018)
20. R. Akhunzyanov et al. (COMPASS collaboration), *Transverse Extension of Partons in the Proton probed in the sea-quark range by measuring the DVCS cross section*, Phys. Lett. **B 793** (2019) 188-194
21. R. Akhunzyanov et al. (COMPASS collaboration), *K^- over K^+ multiplicity ratio for kaons produced in DIS with a large fraction of the virtual-photon energy*, Phys. Lett. **B 786** (2018) 390-398
22. M. Aghasyan et al. (COMPASS collaboration), *Longitudinal double-spin asymmetry A_1^p and spin-dependent structure function g_1^p of the proton at small values of x and Q^2*, Phys.Lett. **B 781** (2018) 464-472
23. M. Aghasyan et al. (COMPASS collaboration), *Transverse-momentum-dependent Multiplicities of Charged Hadrons in Muon-Deuteron Deep Inelastic Scattering*, Phys.Rev. **D 97** (2018) no.3, 032006
24. A. Jackura et al. (JPAC and COMPASS collaborations), *New analysis of $\eta\pi$ tensor resonances measured at the COMPASS experiment,* Phys. Lett. **B 779** (2018) 464-472
25. M. Aghasyan et al. (COMPASS collaboration), *Search for muoproduction of $X(3872)$ at COMPASS and indication of a new state $X(3872)$*, Phys. Lett. **B 783** (2018) 334
26. M. Aghasyan et al. (COMPASS collaboration), *First measurement of transverse-spin-dependent azimuthal asymmetries in the Drell-Yan process,* Phys. Rev. Lett. **119** (2017) 112002
27. C. Adolph et al. (COMPASS collaboration), *First measurement of the Sivers asymmetry for gluons using SIDIS data,* Phys. Lett. **B 772** (2017) 854-864
28. C. Adolph et al. (COMPASS collaboration), *Final COMPASS results on the deuteron spin-dependent structure function g_1^d and the Bjorken sum rule*, Phys. Lett. **B 769** (2017) 34-41

Peer-reviewed conference proceedings

1. A. Kerbizi and L. Lönblad, *Adding quark spin effects to Pythia string fragmentation,* PoS (**ICHEP2022**) 831, arXiv: 2210.06009
2. A. Kerbizi, X. Artru, A. Martin, *Simulation of the polarized quark fragmentation with vector meson production,* JPS Conf. Proc. **37** (2022) 020102, arXiv: 2201.05792.
3. X. Artru and A. Kerbizi, *The String+$^3P_0$ model of hadronization,* JPS Conf. Proc. **37** (2022) 020101, arXiv: 2201.05509.
4. A. Kerbizi (for the COMPASS collaboration), *Transverse spin asymmetries for inclusive ρ^0 production in SIDIS at COMPASS*, SciPost Phys. Proc. **8** (2022) 146
5. A. Kerbizi*, Polarized quark fragmentation within the String+$^3P_0$ model*, Nuovo Cim. **C 44** (2021) 2-3, 50

Conference proceedings

1. A. Kerbizi and L. Lönnblad, *Inclusion of the $^3P_0$ model in PYTHIA 8*, PoS **DIS2019** (2019) 179
2. A. Kerbizi (for the COMPASS collaboration), *Interpretation of the unpolarized azimuthal asymmetries in SIDIS*, PoS **SPIN2018** (2018) 053, arXiv: 1812.07477
3. A. Kerbizi, X. Artru, Z. Belghobsi, F. Bradamante and A. Martin, *A Monte Carlo code for the fragmentation of polarized quarks*, J. Phys. Conf. Ser. **938** (2017) 1, 012051
4. A. Kerbizi, X. Artru, Z. Belghobsi, F. Bradamante and A. Martin, *Recursive Monte Carlo code for transversely polarized quark jet*, Proceedings of the 22nd International Spin Symposium (SPIN 2016), arXiv:1701.08543

E-prints

1. G. D. Alexeev et al. (COMPASS Collaboration), *High-statistics measurement of Collins and Sivers asymmetries for transversely polarised deuterons,* CERN-EP-2023-308, e-Print: 2401.00309 [hep-ex] (submitted for publication to Physical Review Letters).
2. G. D. Alexeev et al. (COMPASS Collaboration), *Final COMPASS results on the transverse-spin-dependent azimuthal asymmetries in the pion-induced Drell-Yan process,* CERN-EP-2023-307, e-Print: 2312.17379 [hep-ex].
3. A. Kerbizi, L. Lönnblad and A. Martin, *Simulation of e^+e^- annihilation with quark spin effects*, (to appear in) Proceedings of 25th International Spin Physics Symposium (SPIN 2023); e-Print: 2312.17034 [hep-ph].
4. A. Kerbizi and X. Artru, *String fragmentation of a quark pair with entangled spin states: application to e^+e^-annihilation*, e-Print: 2312.14694 [hep-ph] (submitted for publication to Physical Review D).
5. A. Kerbizi and X. Artru, *Modeling spin effects in electron-positron annihilation to hadrons,* (to appear in) Proceedings of 20th International Conference on Hadron Spectroscopy and Structure (HADRON2023), e-Print: 2311.03827 [hep-ph].
6. A. Accardi et al., *Strong Interaction Physics at the Luminosity Frontier with 22 GeV Electrons at Jefferson Lab,* arXiv: 2306.09360

7. COMPASS Collaboration, *Transverse-spin-dependent azimuthal asymmetries of pion and kaon pairs produced in muon-proton and muon-deuteron semi-inclusive deep inelastic scattering*, CERN-EP-2022-292, e-Print: 2301.02013 (submitted to Phys. Lett. B)
8. COMPASS Collaboration, *Spin Density Matrix Elements in Exclusive* ρ^0 *Meson Muoproduction,* CERN-EP-2022-231, e-Print: 2210.16932 (submitted to Eur. Phys. J. C.)
9. B. Adams et al., Letter of Intent: *A New QCD facility at the M2 beam line of the CERN SPS (COMPASS++/AMBER),* CERN-SPSC-2019-003 (SPSC-I-250), arXiv:1808.00848 [hep-ex]
10. COMPASS Collaboration and PNPI, *Addendum to the COMPASS-II Proposal (d-Quark Transversity and Proton Radius),* CERN- SPSC-2017-034, SPSC-P-340-ADD-1

Software

1. Title: *StringSpinner*
   Description: Plugin for the introduction of spin effects in the hadronization part of the PYTHIA 8 event generator (in collaboration with L. Lönnblad)
   Language: C++, Fortran
   GitLab repository: https://gitlab.com/albikerbizi/stringspinner.git

Theses

1. A. Kerbizi, *Recursive fragmentation of a polarized quark,* PhD thesis, University of Trieste, https://arts.units.it/handle/11368/2960579#.YVDO9i2uZTY, arXiv:2004.00524
2. A. Kerbizi, *Study of the fragmentation process of transversely polarized quarks,* Master's thesis, University of Trieste
3. A. Kerbizi, *Impulso trasverso dei quark (Transverse momentum of quarks),* Bachelor's thesis, University of Trieste

List of Presentations and Seminars

Invited presentations

1. A. Kerbizi, *StringSpinner – adding spin to the PYTHIA string fragmentation,* 14th International Workshop on Multiple Parton Interactions at the LHC (MPI@LHC 2023), 20-24 November 2023, Manchester (UK).
2. A. Kerbizi, *The role of vector mesons in the interpretation of single spin asymmetries and opportunities with future studies,* 25th International Spin Physics Symposium (SPIN 2023), 24-29 September 2023, Durham, North Carolina (US).
3. A. Kerbizi, *Modeling spin effects in electron-positron annihilation to hadrons,* International Workshop on Hadron Structure and Spectroscopy 2023 (IWHSS-2023), 25-28 June 2023, Prague, Czechia
4. A. Kerbizi, *The role of vector mesons on transverse-spin asymmetries in SIDIS,* Science at the Luminosity Frontier: Jefferson Lab at the 22 GeV Workshop, 23-25 January 2023, Jefferson Lab, Virginia, USA
5. A. Kerbizi, *Spin effects in unpolarized SIDIS using the string+*$^3P_0$ *model*, International Workshop on Hadron Structure and Spectroscopy 2022 (IWHSS 2022), 29-31 August 2022, CERN, Geneva, Switzerland
6. A. Kerbizi, *Introduction of quark spin effects in Pythia string fragmentation for (un)polarized SIDIS*, APCTP Focus Program in Nuclear Physics 2022: Hadron Physics Opportunities with JLab Energy and Luminosity Upgrade, 18-23 July 2022, Pohang, Korea
7. A. Kerbizi, *Adding vector meson production to polarized string fragmentation in Pythia*, 6th International workshop on transverse phenomena in hard processes (Transversity 2022), 23-27 May 2022, Pavia, Italy
8. A. Kerbizi, *Simulation of quark spin effects with Monte Carlo event generators,* Correlations in Partonic and Hadronic Interactions (CPHI-2022), 7-11 March 2022, Duke University, Durham, USA
9. A. Kerbizi, *Overview of TMD studies at COMPASS*, 5th Workshop on the QCD Structure of the Nucleon (QCD-N2021), University of Alcalá, 4-8 October 2021, Madrid, Spain
10. A. Kerbizi, *Spin-orbit correlations in Monte Carlo simulations*, TMD Studies: from JLab to EIC, Jefferson Lab, Newport News, USA, 6-7 May 2021
11. A. Kerbizi, *Monte Carlo simulation of polarized quark fragmentation with the String+* $^3P_0$ *model*, Correlations in Partonic and Hadronic Interactions (CPHI-2020), CERN, Geneve, 3-7 February 2020
12. A. Kerbizi, *Revisited version of a recursive model for the fragmentation of polarized quarks*, MCEGs for future ep and eA facilities, DESY, Hamburg, 20-22 February 2019
13. A. Kerbizi, *Cahn effect contribution to the asymmetry* $A_{cos\,\phi_h}$, COMPASS Meeting, CERN, Geneva, 23-24 September 2014

Presentations

1. A. Kerbizi, *Modeling and simulation of quark spin effects in e^+e^- annihilation to hadrons,* 25th International Spin Physics Symposium (SPIN 2023), 24-29 September 2023, Durham, North Carolina (US).
2. A. Kerbizi, *Modeling spin effects in electron-positron annihilation to hadrons,* 20th International Conference on Hadron Spectroscopy and Structure – HADRON 2023, 5-9 June, 2023, Genova, Italy
3. A. Kerbizi, *Adding quark spin effects to Pythia string fragmentation,* XLI International Conference on High Energy Physics (ICHEP 2022), 6-13 July 2022, Bologna, Italy.
4. A. Kerbizi, *The transverse spin structure of nucleons,* First Conference of the National Institute of Physics, 10-11 February 2022, Tirana, Albania
5. A. Kerbizi, *Vector meson production in the polarized quark fragmentation process,* QCD Evolution Workshop 2021, University of California Los Angeles, UCLA, USA, 10-14 May 2021
6. A. Kerbizi for the COMPASS Collaboration, *Transverse spin asymmetries for inclusive ρ^0 production in SIDIS at COMPASS,* XXVIII International Workshop on Deep-Inelastic Scattering and Related Subjects, Stony Brook University, 12-16 April 2021 (to be published in the proceedings)
7. A. Kerbizi, *Fragmentation of polarized quarks within the String+ $^3P_0$ model*, 106^{th} National Congress of the Italian Society of Physics, 14-18 September 2020 (published in the proceedings)
8. A. Kerbizi, *Inclusion of the $^3P_0$ model in PYTHIA 8*, 27^{th} Workshop on Deep-Inelastic Scattering and Related Subjects - DIS2019, Torino, 8-12 April 2019 (published in the proceedings)
9. A. Kerbizi for the COMPASS Collaboration, *Interpretation of the unpolarized azimuthal asymmetries in SIDIS*, workshop 23rd International Spin Symposium, University of Ferrara, 10-14 September 2018 (published in the proceedings)
10. A. Kerbizi, *A Monte Carlo code for the fragmentation of polarized quarks*, DUBNA SPIN 2017 workshop, Dubna, Russia, 11-15 September 2017 (published in the proceedings)
11. A. Kerbizi, *Recursive Monte Carlo code for polarized quark jet*, 22nd International Spin Symposium, University of Illinois, Urbana-Champain, Illinois, USA, 25-30 September 2016 (published in the proceedings).

Seminars

1. Kerbizi, *The replica method,* Lecture and hands-on session at the Data Science Applications in Physics, Balkan School in Tirana 2024, 22 – 26 Jan 2024 (invited).
2. A. Kerbizi, *Simulation of quark spin effects in electron-positron annihilation*, seminar held at the COMPASS Collaboration Meeting, 30 Nov – 1 Dec 2023, CERN (invited).
3. A. Kerbizi, *The fragmentation of quarks*, seminar for the National Institute of Physics (Instituti Kombetar i Fizikes, IKF), 18 Jul 2023, Tirana (AL).
4. A. Kerbizi, *Modeling quark-spin effects in hadronization*, 31 May 2023, Pavia (invited seminar for the group of hadronic physics).

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