# Satyam Tiwari

Doctoral Researcher in Biophysics • J-PET Group, Jagiellonian University

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I am developing algorithms for reconstructing attenuation maps from detector-scattered coincidences in PET imaging, enabling CT-less PET across the J-PET scanner family. Interests: image reconstruction, Monte Carlo simulation, deep learning for medical imaging, and PET detector instrumentation.

## EDUCATION

**PhD in Biophysics, Jagiellonian University, Kraków** Oct 2024 – 2028 (expected)
*J-PET Group • Supervisors: Prof. Paweł Moskal & Dr. Sushil K. Sharma*
Thesis topic: CT-less PET imaging with the J-PET scanner using detector-scattered photons.

**MSc in Physics, Indian Institute of Technology Bombay** 2022 – 2024
*CPI 8.12/10 • Supervisor: Prof. Pragya Das*
Projects: scattered data for tumour localisation in PET (2D TOF model); 3D annihilation-point estimation for PET reconstruction.

**BSc (Hons.) in Physics, Kirori Mal College, University of Delhi** 2019 – 2022
*CGPA 9.42/10*

## RESEARCH EXPERIENCE

**Doctoral Researcher, J-PET Group, Jagiellonian University** Oct 2024 – present

- Developing **Detector-Scattered Attenuation Correction (DSAC)**: attenuation maps from inter-detector scattered coincidences, without CT.
- Joint reconstruction (DS-MLAA, MLTR), analytical blank-scan modelling and GATE/Monte Carlo studies across LYSO, BGO and plastic scanners.
- Deep-learning denoising of attenuation maps; team member of the NCN **MAESTRO** project.

**Content Developer, Vizuara (EdTech start-up)** Sep – Dec 2022
Animated K–12 physics and maths explainers with Manim.

## PATENT

- **S. Tiwari**, P. Moskal, S. K. Sharma, E. Stępień, "Generating Attenuation Map from Detector-Scattered Coincidence Events in Positron Emission Tomography," *US Patent Application No. 19/859,844*, filed 2 Nov 2026; priority: Polish Patent Application No. P.457524 (29 Oct 2026). Applicant: Jagiellonian University. **Patent pending.**

## PUBLICATIONS

16 publications • full list: koza.if.uj.edu.pl/staff/stiwari

### FIRST-AUTHOR

[1] **S. Tiwari**, S. K. Sharma, P. Moskal, "Feasibility study of using detector-scattered photons for attenuation correction in CT-less PET imaging," *Bio-Algorithms and Med-Systems 21, 13–20 (2025)*. 10.5604/01.3001.0055.4655

### SOFTWARE

[2] **S. Tiwari**, "BiblioAudit: Automated Citation Integrity & Verification Tool" (v2.2.2) [Software], *Zenodo* (2025). `pip install biblioaudit`. 10.5281/zenodo.18155557

### CO-AUTHORED (J-PET COLLABORATION)

[3] Paweł Moskal, . . . , **S. Tiwari**, et al., "First-in-human quantum entanglement imaging," *arXiv preprint (2026)*. arXiv:2606.29421

[4] Magdalena Skurzok, . . . , **S. Tiwari**, et al., "Experimental determination of the Dalitz plot for positronium decay using the J-PET detection system," *Physics Letters B 882, 141018 (2026)*. koza.if.uj.edu.pl

[5] Szymon Parzych, . . . , **S. Tiwari**, et al., "Feasibility simulation study of positronium lifetime imaging with the Biograph Vision Quadra and J-PET tomographs," *EJNMMI Physics 13, 102 (2026)*. 10.1186/s40658-026-00920-1

[6] Sushil K. Sharma, . . . , **S. Tiwari**, et al., "First direct determination of the pick-off contribution to the ortho-positronium decay rate," *Physics Letters B 879, 140610 (2026)*. 10.1016/j.physletb.2026.140610

[7] Krzysztof Kacprzak, . . . , **S. Tiwari**, et al., "Methodology for time and TOT calibration of a modular J-PET scanner with prompt gamma emitters $^{22}$Na and $^{44}$Sc," *Bio-Algorithms and Med-Systems 22, 36 (2026)*. 10.5604/01.3001.0055.6703

[8] Reimund Bayerlein, Manish Das, . . . , **S. Tiwari**, et al., "Monte Carlo-based scatter correction for the plastic-based modular PET scanner J-PET," *Physics in Medicine & Biology 71, 075026 (2026)*. 10.1088/1361-6560/ae54fb

[9] Manish Das, . . . , **S. Tiwari**, et al., "First positronium imaging using $^{44}$Sc with the J-PET scanner: a case study on the NEMA image quality phantom," *IEEE Trans. Radiat. Plasma Med. Sci. 10(4), 593 (2026)*. 10.1109/TRPMS.2025.3621554

[10] Manish Das, . . . , **S. Tiwari**, et al., "First positronium lifetime imaging using $^{52}$Mn and $^{55}$Co with a plastic-based PET scanner," *Scientific Reports 16, 16230 (2026)*. 10.1038/s41598-026-43965-z

[11] Karol Kubat, . . . , **S. Tiwari**, et al., "First ex-vivo positronium imaging of tissues with modular J-PET scanner using $^{44}$Sc radionuclide," *Z. Med. Phys. 36, 357–365 (2026)*. 10.1016/j.zemedi.2026.03.004

[12] Neha Chug, . . . , **S. Tiwari**, et al., "Studies of CPT symmetry in positronium decays with the 192 plastic strip J-PET detector," *Physical Review D 113, 032003 (2026)*. 10.1103/wy7r-xgl9

[13] Alessio Porcelli, . . . , **S. Tiwari**, et al., "$\mu$PPET: Investigating the muon puzzle with J-PET detectors," *Universe 11, 180 (2025)*. 10.3390/universe11060180

### CONFERENCE PROCEEDINGS

[14] Manish Das, . . . , **S. Tiwari**, et al., "First experimental demonstration of positronium lifetime imaging with $^{44}$Sc using the J-PET scanner," *2025 IEEE NSS/MIC/RTSD, Yokohama*. 10.1109/NSS/MIC/RTSD57106.2025.11286751

[15] Keyvan Tayefi Ardebili, . . . , **S. Tiwari**, et al., "Development of a cost-effective Total Body J-PET from plastic scintillators: definitive design," *2025 IEEE NSS/MIC/RTSD, Yokohama*. 10.1109/NSS/MIC/RTSD57106.2025.11287221

[16] M. Rädler, . . . , **S. Tiwari**, et al., "Simulation studies of a brain PET insert for the Total Body J-PET tomograph," *2025 IEEE NSS/MIC/RTSD, Yokohama*. 10.1109/NSS/MIC/RTSD57106.2025.11286628

[17] Reimund Bayerlein, . . . , **S. Tiwari**, et al., "Monte Carlo-based scatter correction for J-PET," *2025 IEEE NSS/MIC/RTSD, Yokohama*. 10.1109/NSS/MIC/RTSD57106.2025.11287184

## CONFERENCE CONTRIBUTIONS

**IEEE NSS/MIC/RTSD 2026**, Granada, Spain – *Poster* • **Trainee Grant** Nov 2026

A Comparative Simulation Study of DSAC for CT-less PET: LYSO vs Plastic vs BGO Scanners

**Total-Body PET 2026**, UC Davis, USA – *Poster* • **Presentation Award** • Travel Grant Sep 2026

CT-less Attenuation Correction Using Detector-Scattered Photons in Plastic-Scintillator Total-Body PET: A Monte Carlo Study

**6th Jagiellonian Symposium**, Kraków – *Talk* • core organiser Jul 2026

Analytical Modelling of Blank Scan in Detector-Scattered Attenuation Correction (DSAC)

**MCSB 2026**, Kraków – *Talk* May 2026

Deep-learning enhancement of detector-scatter attenuation maps for CT-less plastic-scintillator PET

**FTMI-TBPET-PSMR 2026**, Valencia, Spain – *Talk* May 2026

DSAC: A Novel CT-less Attenuation Correction Approach for Cost-Effective Plastic-Scintillator Total-Body PET

**EMIM 2026**, Ljubljana, Slovenia – *Poster* Mar 2026

CT-less Attenuation Correction via ML Reconstruction (DS-MLAA)

**2nd Total-Body J-PET General Meeting**, Kraków – *Talk* • core organiser Jan 2026

**2nd Symposium on New Trends in Nuclear & Medical Physics**, Kraków – *Poster* • organiser Sep 2025

**1st Total-Body J-PET General Meeting**, Kraków – *Talk* Oct 2024

### SCHOOLS

AI in Medical Imaging Summer School, Radboud University, Nijmegen Jun – Jul 2025

## AWARDS & GRANTS

**Trainee Grant**, IEEE NSS/MIC/RTSD 2026 (registration fee covered) — Nov 2026
**Presentation Award**, Total-Body PET 2026, UC Davis — Sep 2026
**Travel Grant**, Total-Body PET 2026, UC Davis — Sep 2026
**TD-UJ Research Grant** (×3), Jagiellonian University — Jun 2024 • Apr 2026 • Sep 2026
**STER Mobility Grant**, NAWA (international research internship) — 2026
**Visibility & Mobility Grant**, ID UJ — Apr 2026
**PROM Mobility Grant**, NAWA — Feb 2025
**All India Rank 15**, IIT JAM Physics — Mar 2022
**National Topper (top 1%)**, National Graduate Physics Examination, IAPT — May 2022

## TEACHING & SERVICE

**Teaching Assistant**, Jagiellonian University – Monte Carlo methods lectures; Python for beginners
**Peer Reviewer**, *EJNMMI Physics*; *Bio-Algorithms and Med-Systems* — 2026 – present
**Doctoral Council Representative**, Biophysics PhD students, Jagiellonian University — 2025 – 2026
**TD-UJ Interdisciplinary Team**: Research Salons, seminars; Housing Committee — 2025 – 2026
**Department Coordinator**, ISCP, IIT Bombay: PG orientation for 1500+ students; mentored 7 juniors — 2023 – 2024

## SKILLS

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|---|---|
| **Imaging & simulation** | GATE/Geant4, Monte Carlo, iterative reconstruction (MLAA, MLTR), ROOT |
| **Programming** | Python, C++, SQL, Fortran, Mathematica, MATLAB |
| **Machine learning** | TensorFlow, scikit-learn, NumPy, Pandas |
| **Certifications** | Fast-timing Scintillation Detectors for Medical Applications; Machine Learning Specialization (Andrew Ng); Neural Networks & Deep Learning (DeepLearning.AI) |

## REFERENCES

**Prof. dr hab. Paweł Moskal** (PhD supervisor)
Head, Cluster of Nuclear Physics Departments; J-PET group leader, Jagiellonian University
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**Dr. Sushil K. Sharma** (PhD co-supervisor)
Assistant Professor, Institute of Physics, Jagiellonian University
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