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pvlib

pvlib python Updates and Users Group Meeting

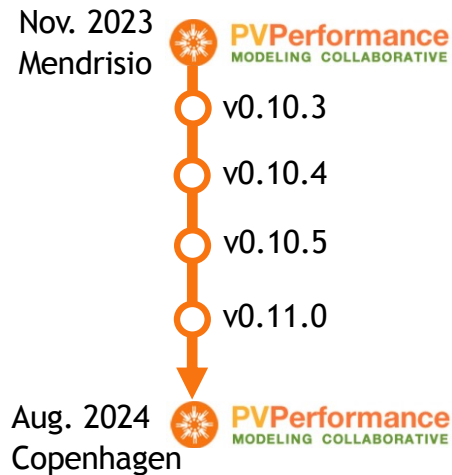
2024 PVPWC Workshop
Copenhagen
Aug 22, 2024

SAND2024-11094C



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pvlib python since last year



- Since v0.10.2
 - ~90 PRs merged
 - 35+ total contributors
- Many bugfixes & documentation improvements

Full details: <https://pvlib-python.readthedocs.io/en/stable/whatsnew.html>

pvlib python since last year



pvlib.iotools

- Solargis
- Solcast
- Solaranywhere
- horizon profile
- Precipitation
- Snowfall

Irradiance

- Louche
- Orgill-Hollands
- Perez-Driesse
- Erbs-Driesse

**Row-to-row shadow
calculation & shade loss model**

Spectrum

- PVSPEC spectral factor
- JRC spectral factor
- QE/SR conversion
- reference spectra

FPV temperature and albedo

Faster SPA

IAM parameter fitting and conversion functions

Compatibility with pandas 2.0 and numpy 2.0

Publications



pvlib python: 2023 project update

Kevin S. Anderson ^{a,1}, Clifford W. Hansen ^{a,1}, William F. Holmgren ^{a,2}, Adam R. Jensen ^{a,3}, Mark A. Mikofski ^{a,2}, and Anton Driesse ^{a,4}

¹ Sandia National Laboratories ² DNV ³ Technical University of Denmark ⁴ PV Performance Labs

DOI: [10.21105/joss.05994](https://doi.org/10.21105/joss.05994)

Software

- [Review](#)
- [Repository](#)
- [Archive](#)

Editor: [Rachel Kurchin](#)

Reviewers:

- [@EwaGomez](#)
- [@phoebe-p](#)

Submitted: 18 September 2023

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Summary

pvlib python is a community-developed, open-source software toolbox for simulating the performance of solar photovoltaic (PV) energy components and systems. It provides reference implementations of over 100 empirical and physics-based models from the peer-reviewed scientific literature, including solar position algorithms, irradiance models, thermal models, and PV electrical models. In addition to individual low-level model implementations, pvlib python provides high-level workflows that chain these models together like building blocks to form complete “weather-to-power” photovoltaic system models. It also provides functions to fetch and import a wide variety of weather datasets useful for PV modeling.

pvlib python has been developed since 2013 and follows modern best practices for open-source python software, with comprehensive automated testing, standards-based packaging, and semantic versioning. Its source code is developed openly on GitHub and releases are distributed via the Python Package Index (PyPI) and the conda-forge repository. pvlib python’s source code is made freely available under the permissive BSD-3 license.

Here we (the project’s core developers) present an update on pvlib python, describing capability and community development since our 2018 publication ([Holmgren, Hansen, & Mikofski, 2018](#)).

Statement of need

PV performance models are used throughout the field of photovoltaics. The rapid increase in



Solar Energy

Volume 266, December 2023, 112092



Data article

pvlib iotools—Open-source Python functions for seamless access to solar irradiance data

[Adam R. Jensen](#)^a, [Kevin S. Anderson](#)^b, [William F. Holmgren](#)^c, [Mark A. Mikofski](#)^c, [Clifford W. Hansen](#)^b, [Leland J. Boeman](#)^d, [Roel Loonen](#)^e

Highlights

- Open-source Python functions for reading and retrieving irradiance data.
- Standardized functions ensure seamless switching between data providers.
- Support for retrieving data from 12 open solar irradiance datasets.

<https://doi.org/10.21105/joss.05994>

<https://doi.org/10.1016/j.solener.2023.112092>

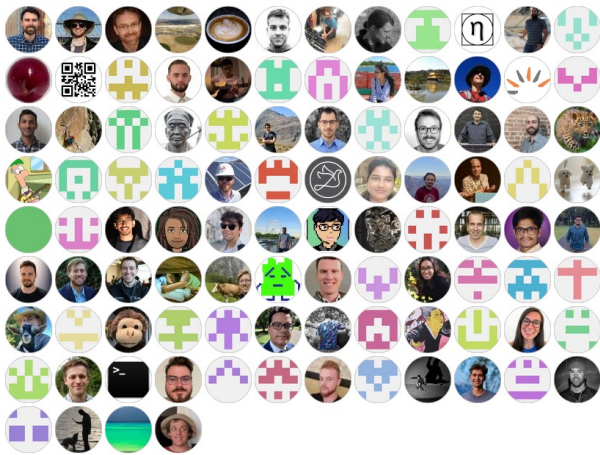


Real-world usage



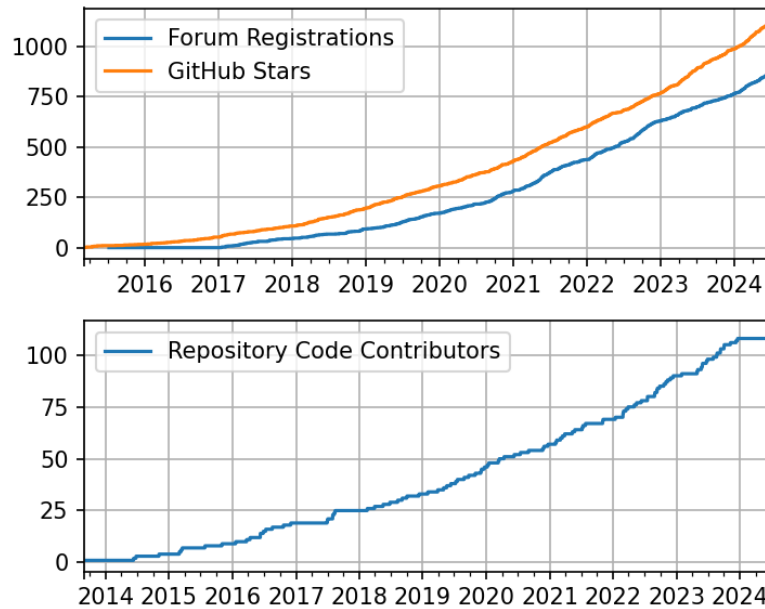
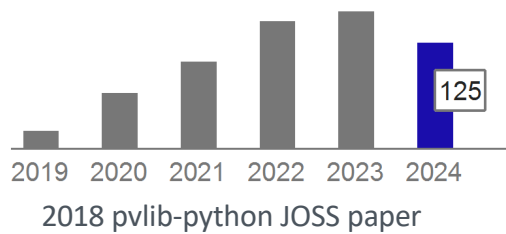
Image: BayWa r.e.

Project



120+ GitHub contributors

Cited by 629



2024_Modeling_Webinar

A tutorial for PySAM and pvlib-python for the DOE Open-Source Tools & Open-Access Solar Data webinar series, Part 3: Modeling Tools.

[Repository](#) [Website](#) [Recording](#)

Stars 5

Data prize webinar material
<https://pv-tutorials.github.io/>





Google Summer of Code



May 27 - August 26

Shading & Spectrum Echedey Luis

- Row-to-row shade loss
- Reduced-order EMM model
- PAR model
- Reference spectra and PV SR/QE curves
- Documentation

Floating PV Ioannis Sifnaios

- FPV albedo, temperature modeling
- Wind speed conversion
- Documentation

Spectral corrections Rajiv Daxini

- Several spectral correction models
- Documentation

What does it mean to contribute?



A few types of contributions:

- Implement a model based on a published paper
- Add an example to the Gallery in the documentation
- Fix typos/improve sentence clarity in the documentation
- Reporting bugs

Read more at pvlb's contributing guide:

- <https://pvlb-python.readthedocs.io/en/stable/contributing.html>

Governance



What?

- “Formal rules for making decisions”
 - includes roles, expectations, membership, and powers

Why?

- Transparency about decision making
- Avoid problematic scenarios in the future
- Follow good open source community practices

Breakout tables



Introduction to pvlb

Never used pvlb before
Not sure what all the fuss is about
Run through a simple tutorial



Adam

Usage questions

Already using pvlb
I tell my friends about how cool it is
Not sure about how to use pvlb for X



Cliff

Hackathon

Follow a tutorial
Solve a PV modeling problem
pv-tutorials.github.io



Kevin

Make your first contribution

Already use pvlb
Like the idea of having “your code” in pvlb
Learn how to use git, and make a PR
Talk about GSoC 2025



Dax



Ioannis



Echedey

Shop talk

Chat about pvlb with other PV modelers



Marios



Josh

What would Adam and Kevin like to see



Functionality

- Shading
- Inverter operating ranges
- Transformers
- SAT improvements
- “interfaces” - e.g. transposition models return isotropic, circumsolar, horizon

Documentation

- Long-awaited documentation overhaul
- Alternatives comparison tables: various model types, iotools datasets
- Roadmap
- pvlib.org

What would Adam and Kevin like to see



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Project growth



Project

- Deprecation/support policy
- Periodic tasks
 - Update roadmap
 - Evaluate “dead batteries” in pplib
- Strategy for recruiting developers & maintainers
- Regular community calls
- “Steering council”?
- NumFOCUS sponsorship?

Community Discussion



- show how to open an issue. that gets their foot in the door, and we can help them from there
- show how to fix a typo in a PR
- **how can we make it easier/more accessible to be part of the community? do you guys feel part of it? what are the barriers?**
- what are the requirements for something to be added to pplib?
- **governance?**
- josh: PVP MC quickstart guide?

Hackathon



- Begin your first PR?
- Tutorial content
 - <https://pv-tutorials.github.io>
- Topic-focused tables

