Free and open-source software for soundscape visualization and binaural analysis

soundscapy

Soundscapy: A python package for soundscape assessment and analysis

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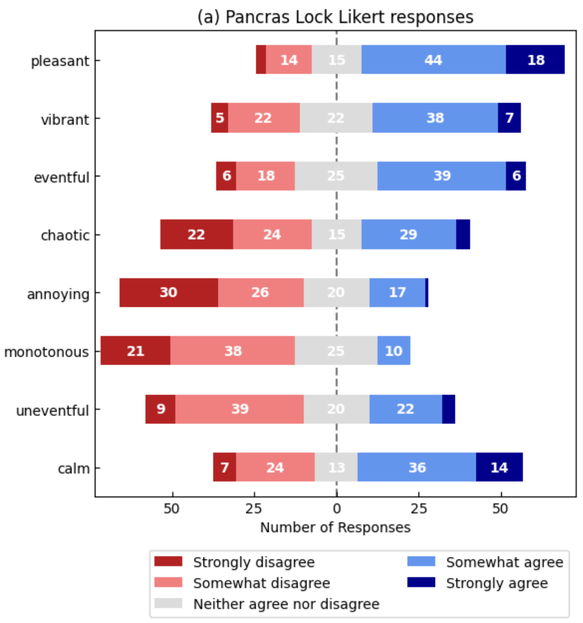
INTRO

- Soundscapy is a Python package designed to simplify the analysis of soundscape questionnaire and recording data.
- Implements the circumplex plotting methods proposed in ISO 12913-3 and Mitchell, Aletta, & Kang (2022).
- Automatically performs validation checks on datasets and calculates the ISO 12913 coordinate projections to get ISOPleasant and ISOEventful values.

Raw Response Plotting – Stacked Bar and Radar

Soundscapy includes standard plots of the questionnaire responses, using either a stacked bar (Likert-style) or a radar plot.



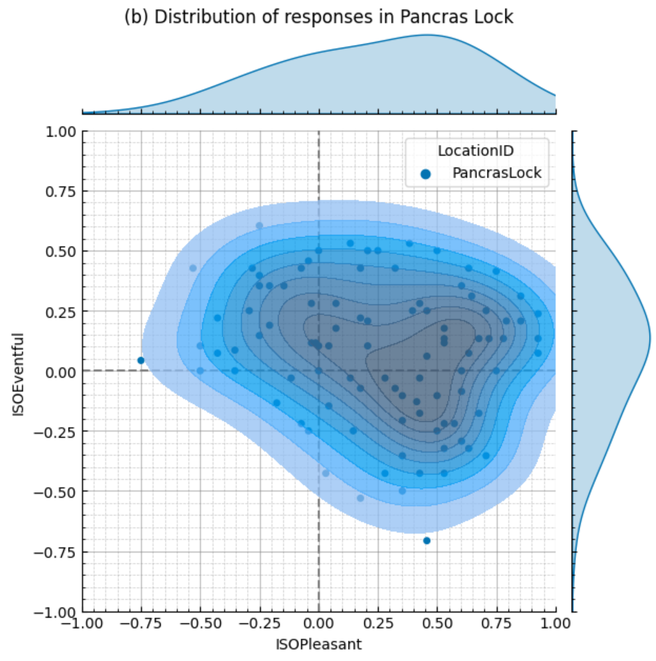
However, these attributes can be difficult to analyse individually. Instead we might prefer to work with two-dimensional continuous data.

The Circumplex Coordinates Approach

- By using the coordinate projection from ISO12913, we can instead **treat each response as a coordinate point**, and groups of responses as a distribution.
- **In contrast to ISO12913** the approach proposed in Mitchell, Aletta, & Kang (2022) transforms **each response separately.**

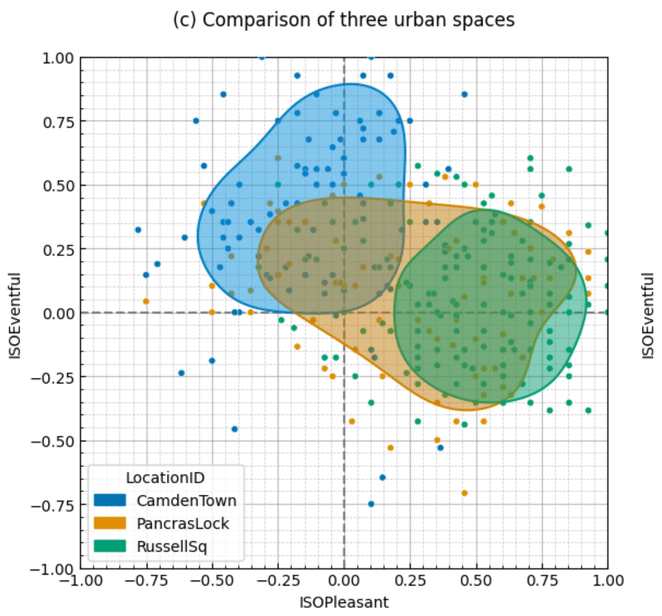
PROBABLILISTIC CIRCUMPLEX PLOTTING

- Soundscapy makes it easy to calculate, visualize, and further analyse these distributions.
- Figure (b) demonstrates the **distribution of soundscape assessments** in an urban area, with decile contour curves and marginal distributions.



Simplified Comparisons

- Figure (c) shows how simplifying the distribution to the 50th percentile, it is easy to **make comparisons between locations, groups, or conditions.**



STRUCTURE & COMMANDS

Below is an example of all the code required to load the ISD, validate the data, and produce Figure (c) shown to the left.

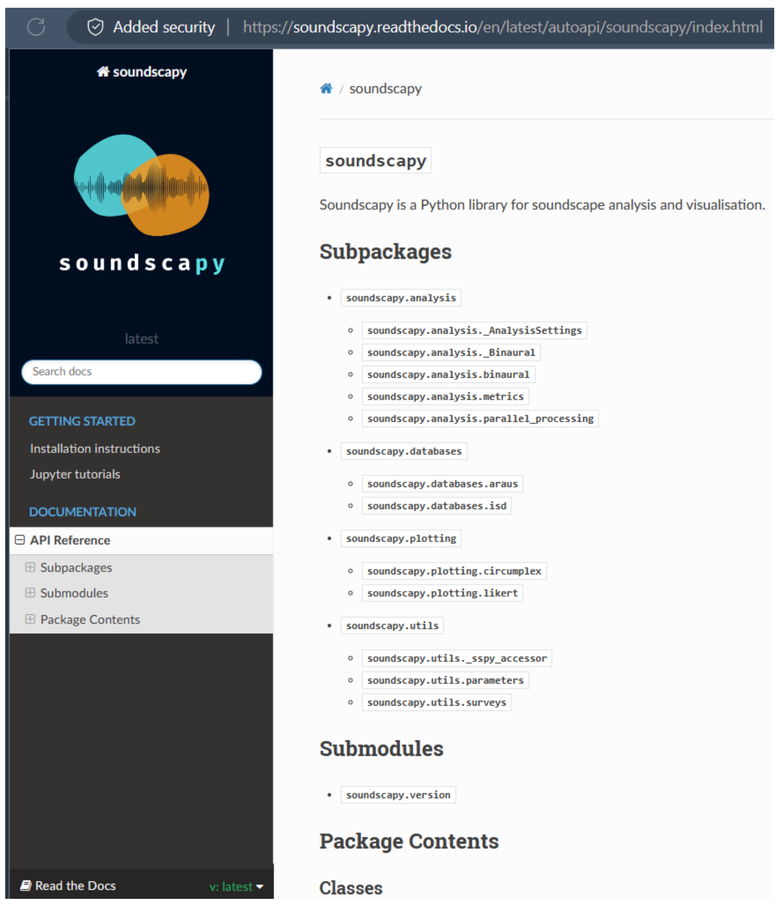
```
import soundscapy as sspy

data = sspy.isd.load_isd_dataset()
data, excl_data = data.sspy.validate_dataset(allow_na=False)

locations = ["CamdenTown", "PancrasLock", "RussellSq"]

data.query("LocationID in @locations").sspy.density(
    title = "Comparison of three locations",
    hue = "LocationID",
    density_type = "simple
)
```

Documentation and examples are available:



THE FUTURE

We aim to release a stable v1.0 in the next few months, with improved documentation and testing. Our plans for future enhancements are:

- Structural Summary Method (SSM)
- Integration of other datasets – ISD, ARAUS, SATP
- Soundscapy_viz GUI web app
- (Longterm) Incorporation of a predictive soundscape model to go from binaural recording to predicted soundscape plot.

PSYCHOACOUSTIC AND ECO-ACOUSTIC ANALYSIS

- In addition to making it simpler to work with soundscape survey data, Soundscapy makes it easy to perform **bulk analysis of binaural recordings**.
- By providing a streamlined and repeatable frontend to analysis libraries such as MoSQito, scikit-maad, and python-acoustics, we make it possible to calculate a wide range of metrics from **psychoacoustics, eco-acoustics, and environmental acoustics with consistent settings**.
- Calculation settings can be saved and shared in a JSON file.
- **Parallel calculations** drastically speed up bulk-processing.

```
from soundscapy import Binaural
b = Binaural.from_wav("example.wav")
b.mosqito_metric('loudness_zwtv', statistics=(5,50,'avg', 'max'), as_df=True, parallel=True
```

```
- Calculating MoSQITo metric: loudness_zwtv
```

[11]:

Recording	Channel	N_5	N_50	N_avg	N_max
CT101	Left	28.834482	23.164299	22.669519	36.160815
	Right	30.834215	23.939352	23.774119	37.762344

Scan to learn about and install Soundscapy

Scan to download the full paper

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