

Clara Hollomey, Alejandro Osses, Piotr Majdak, Leo Varnet

The Auditory Modeling Toolbox Structure



Paris, 17th May 2022

Aims of the AMT

Provide a wide collection of models

- » documentation
- » arbitrary programming languages
- » (nearly) arbitrary licenses

Simplify scientific auditory modeling

- » unification
- » verification
- » handle large amounts of data
- » avoid long computation times

Homepage

The screenshot displays the homepage of the Auditory Modeling Toolbox (AMT) website. The browser address bar shows 'amtoolbox.org'. The main heading is 'THE AUDITORY MODELING TOOLBOX'. Below it is a navigation menu with links: HOME, DOWNLOAD, CONTRIBUTORS, CITE US, MODELS, DOCUMENTATION, DEVELOPMENT, and RESOURCES. The 'HOME' link is highlighted. The central diagram illustrates the auditory modeling process. It features a blue box on the left with the 'amt' logo and the text 'Auditory Modeling Toolbox'. To its right, a dashed blue box contains a horizontal sequence of six white boxes: 'Outer ear', 'Middle ear', 'Basilar-membrane', 'Hair cells', 'Auditory nerve', and 'Brain-stem'. Above the 'Outer ear' box is the label 'Left ear', and below the 'Brain-stem' box is the label 'Right ear'. Three horizontal arrows point from the 'Brain-stem' box to a final box on the right labeled 'Perception & Behavior'. The top arrow is blue, the middle one is green and labeled 'Binaural', and the bottom one is red. The 'Perception & Behavior' box lists 'Loudness', 'Speech', '...', and 'Spatial'.

THE AUDITORY MODELING TOOLBOX

[HOME](#) [DOWNLOAD](#) [CONTRIBUTORS](#) [CITE US](#) [MODELS](#) [DOCUMENTATION](#) [DEVELOPMENT](#) [RESOURCES](#)

The diagram illustrates the Auditory Modeling Toolbox (AMT) architecture. It shows a flow from the 'Left ear' and 'Right ear' inputs through a series of processing blocks: 'Outer ear', 'Middle ear', 'Basilar-membrane', 'Hair cells', 'Auditory nerve', and 'Brain-stem'. The output of the 'Brain-stem' block is processed by 'Perception & Behavior' modules, which include 'Loudness', 'Speech', and 'Spatial' components. The diagram also indicates 'Binaural' processing between the two ears.

The Matlab/Octave toolbox for auditory modeling.

The AMT is maintained by the [ARI/ÖAW](#) with contribution from [many](#) enthusiastic research groups.

The AMT is [free](#) software released under the GNU GPL version 3 (some models differently licensed).

[DOWNLOAD](#)

Getting started...

1 check out the homepage: amtoolbox.org

- » **download** the AMT, unzip and put folder to desired location
- » open the Documentation: amtoolbox.org/doc

2 start Matlab in AMT top directory

- » type **amt_start**

amt_start

```
>> amt_start

*****

AMT version 1.2.0. (C) Piotr Majdak, Clara Hollomey, and contributors.
See http://amtoolbox.org for more information.

*****

* LTFAT: LTFAT version 2.4.0. Copyright 2005-2018 Peter L. Søndergaard. For help, please type "help LTFAT".
* Signal Processing Toolbox: Found.
* Statistics and Machine Learning Toolbox: Found.

*****

Starting optional third-party toolboxes:
* SOFA: SOFA Matlab/Octave API version 1.1.3. Copyright 2013 Acoustics Research Institute (piotr@acoustics.aau.dk)
* SFS: Toolbox version 2.5.0 loaded
* CIRCSTAT: Circular statistics toolbox found.
* BINAURALSH: BinauralSH toolbox loaded.

*****

Internal configuration:

Auxiliary data (local): /home/clara/amtoolbox_1.2/amtoolbox-code-files/amtoolbox-full-1.2.0/auxdata
Auxiliary data (web): http://amtoolbox.org/amt-1.2.0/auxdata
Cache mode: Download precalculated results. Examples:
    exp_model(...)          shows precalculated results
    exp_model(...,'redo')   enforces recalculation

Check your configuration via [flags, keyvalues] = amt_configuration().
Type "help amt_start" for more details...
```

fx>>

Documentation

Go to function

absolutethreshold



Categories

Main



Core functions



Models



Model stages



Demos



Experiments



Common functions



Plot



Signals



Data



HRTFs



AMT - Online documentation

General

This is the most complete, and up-to-date description of the AMT. It consists of auto-generated documentation of all models and other functions included in the AMT. This documentation is directly included in the M-files. Note that because of the automatic generation, the appearance on the website may suffer some details.

The current status of the models can be found in the section "Models" at this website.

Changes from previous AMT versions can be found in CHANGES.

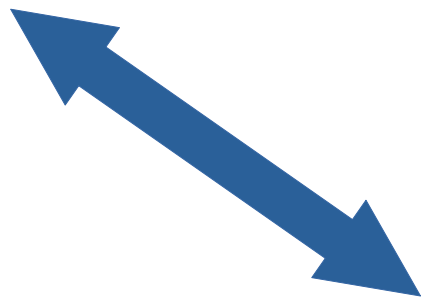
New to the AMT?

- [amt_start](#) - Start the AMT. Only the third-party toolboxes available on your system will be loaded. Note that the LTFAT is an essential toolbox and still will be downloaded and installed.
- [changes](#) - Changes to previous versions

Note that the AMT full package provides all third-party toolboxes and pre-compiled binaries. For more details, read the documentation of [amt_start](#) and [amt_mex](#).

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View the code

Categories

amt_start

- `amt_start(`install`)`
 - installs the thirdparty toolboxes
- `amt_start(`display_flag`)`
 - verbose
 - silent
 - documentation
- `amt_start(`cache_mode`)`

Long computation times: amt_cache

- Works only in functions:
 - store result: `amt_cache('set', package, variables);`
 - get result: `var = amt_cache('get', package, flags);`
- Flags:
 - **'normal'**: only recalculate if package not found online
 - **'redo'**: always recalculate
 - **'online'**: never recalculate

Paths and configuration

- » `amt_start(varargin);`
- » `[flags, kv] = amt_configuration;`
- » `amt_stop;` %remove all AMT paths, delete vars

Documentation

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- » The actual models:
- » naming:

<first_author><publication_year>

- » e.g. bruce2018

Verification: Model and data rankings

Not everything is perfect.

Check the model status on:

<http://amtoolbox.org/models.php> or via
`amt_info(`modelname`);`

Peripheral models	Function	Doc	Code	Verification
Gammatone filterbank	gammatone	✓	✓	✓
Linear filtering for monaural masking (basic)	dau1996	○	✓	?



unknown/OK



good



untrusted



perfect

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» Demos:

» Matlab/Octave scripts to get quick insights on models

» e.g. demo_verhulst2015

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» Experiments:

» reproduce plots from publications

» e.g. exp_osses2021

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Functions used by many models:

- » Signal levels and thresholds
- » Converters
- » Filters
- » Feature extractors
- » ...and more

Core functions

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AMT - Core functions

Installation and session management

- [amt_mex](#) - Compile binaries (Mex/Oct interfaces)
- [amt_stop](#) - Stop the AMT session and remove all AMT paths

General functions

- [amt_cache](#) - Cache variables for later or retrieves variables from cache
- [amt_disp](#) - AMT-specific overload of the function 'disp'
- [amt_emuexp](#) - Emulate psychoacoustic experiments
- [amt_flags](#) - Return the start-up flags of the AMT
- [amt_load](#) - Load auxiliary data of a model
- [amt_subdir](#) - Perform a recursive file search
- [amt_extern](#) - Execute functions in an external environment (e.g., Python)

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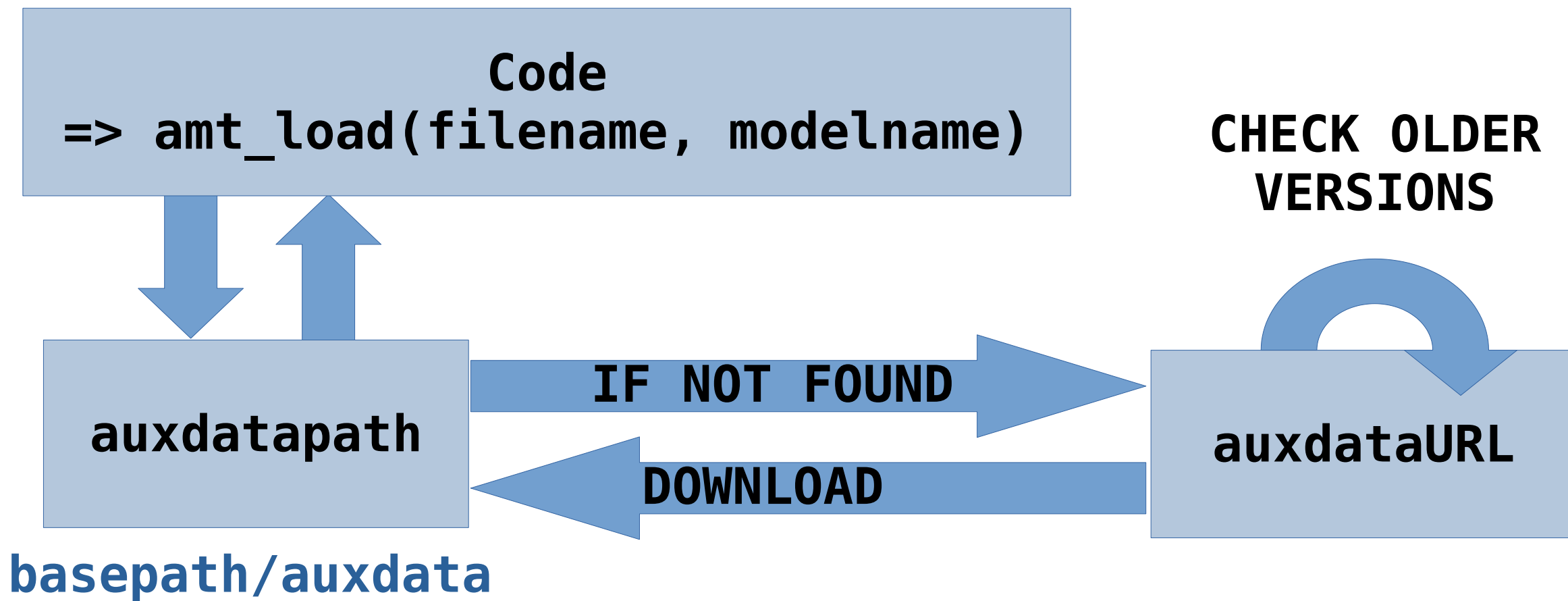
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Handle auxiliary data: `amt_load`



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You should by now...

- Know the AMT's structure, its documentation and where to find information
- Know the AMT's core functions and their purpose

What questions do you have?