Artefact removal lets do ICA

https://www.researchgate.net/publication/274397371\_EEG\_artifact\_removal\_-\_State-of-the-art\_and\_guidelines

<https://www-sciencedirect-com.ezproxy.library.uq.edu.au/science/article/pii/S098770531630199X>

<https://ac-els-cdn-com.ezproxy.library.uq.edu.au/S0010482513002114/1-s2.0-S0010482513002114-main.pdf?_tid=77d39e50-8296-47f8-951b-832197147471&acdnat=1522134880_14972d23f9ed054d63c72a5b02adc53a>

<https://www-sciencedirect-com.ezproxy.library.uq.edu.au/science/article/pii/S098770531630199X#bib0730>

<https://ac-els-cdn-com.ezproxy.library.uq.edu.au/S0987705314000926/1-s2.0-S0987705314000926-main.pdf?_tid=f82faa29-b6eb-4d6d-b8d8-b91edac6d902&acdnat=1522134839_bf6dd558071e70c0e5f104a1c0016a17>

<https://ac-els-cdn-com.ezproxy.library.uq.edu.au/S0165027012001860/1-s2.0-S0165027012001860-main.pdf?_tid=a7d3f96d-8dc9-4f45-a259-785ea3655018&acdnat=1522134862_c39faeef182e6521f77cb5fade3738f4>

final?

<https://pdfs.semanticscholar.org/f916/d83be79cf77b86e02e661327e76c3cd5fcb3.pdf>

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Cross validation

What you do is simply to split your dataset into k non-overlapping subsets (folds), train a model using k-1 folds and predict its performance using the fold you left out. This you do for each possible combination of folds (first leave 1st fold out, then 2nd, ... , then kth, and train with the remaining folds). After finishing, you estimate the mean performance of all folds (maybe also the variance/standard deviation of the performance).

How to choose the parameter k depends on the time you have. Usual values for k are 3, 5, 10 or even N, where N is the size of your data (that's the same as *leave-one-out cross validation*). I prefer 5 or 10.

Model selection

Let's say you have 5 methods (ANN, SVM, KNN, etc) and 10 parameter combinations for each method (depending on the method). You simply have to run cross validation for each method and parameter combination (5 \* 10 = 50) and select the best model, method and parameters. Then you re-train with the best method and parameters on all your data and you have your final model.

There are some more things to say. If, for example, you use a *lot of methods and parameter combinations* for each, it's very likely you will overfit. In cases like these, you have to use *nested cross validation*.

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BCI Competition IV dataset 2a – you can get a list of trials with artefacts and just remove them… <https://ac.els-cdn.com/S1877050916305464/1-s2.0-S1877050916305464-main.pdf?_tid=eccecba8-2e7e-4067-944f-382529447a5f&acdnat=1525560599_ee69c8f508f6698605e5d4b89af47fc0>

**Feature Extraction**

Frequency analysis technique:

<https://ieeexplore-ieee-org.ezproxy.library.uq.edu.au/document/4536580/>

ERD/ERS

<https://www-sciencedirect-com.ezproxy.library.uq.edu.au/science/article/pii/S1388245799001418>

Online frequency bands as features:

https://www.worldscientific.com/doi/abs/10.1142/S0129065716500325

**Similar previous studies:**

<https://link-springer-com.ezproxy.library.uq.edu.au/article/10.1007/s00521-016-2236-5>

https://www.researchgate.net/figure/EEG-electrode-grid-configuration-used-in-our-experiments-The-35-channels-of-the-EEG\_fig1\_51034147

Binary PSO

<https://www.quora.com/What-is-Binary-Particle-Swarm-Optimization-How-does-it-work>

<http://www.jsoftware.us/vol3/jsw0309-04.pdf>

^^This one is it^^

Feature Selection

<https://thuijskens.github.io/2017/10/07/feature-selection/>

Laplacian Surface

<https://www-sciencedirect-com.ezproxy.library.uq.edu.au/science/article/pii/S0167876015001749>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4537804/>

MRMR

<https://ieeexplore-ieee-org.ezproxy.library.uq.edu.au/stamp/stamp.jsp?tp=&arnumber=1453511>

plan: investigate EEGLAB AAR plugin, refilter data. Get features again.

Keep for thesis: (not used for conference paper)

The performance metric used to evaluate the fitness of any candidate set where:

is given by the following error function:

Where denotes the classification error given by the SVM trained using the set , and is a coefficient scaling the penalty of including parameters. The addition of the penalisation term encourages the reduction of the number of features, however this penalty must be scaled appropriately as to significantly impact the number of features GA includes but not overpower the contribution of the classification error. The two terms must be balanced. An appropriate value was found through preliminary experimentation.