**Changes in NM 1.4**

* **ML Optimization**: Simulated Annealing and Bayesian Optimization to handle large hyperparameter spaces.
* **Ensemble-based optimization (filter-based methods)**: Refactored code for the computation of ensemble diversity metrics (vote-entropy, diversity, kappa diversity, bias-variance decomposition) and for the ensemble optimization algorithms using greedy forward ensemble generation and backward model elimination. Combined optimization (performance + diversity measures) include now regularization options to avoid overfitting. The new code has been completed for binary / regression scenarios, and for multi-class.
* **ML Methods**: Tensor flow models
* **Configuration** **of hyperparameter ranges** for dimensionality reduction (DR) and extraction of dimensions following DR: “user-defined (as in NM 1.3), geometric, and power”
* **Configuration of cross-validation** to deal with small batches (remove n=1 batches, move batches with N<=5 to test folds) in stratified cross-validation. Generate log file of cross-validation cycle generation.
* **Robustness refactoring of nk\_ParamReplicator.m** (key function to map indices to trained hyperparameter data shelves correctly)
* **Preprocessing**
  + *F-Score computation*: class-imbalance sensitive, bootstrapping for stability, mean or median-based F-Score computation, (new MEX file for compute of mean (SD) based version)
  + *Skewness correction* withlog-based, Box-Lambda and Yeo–Johnson methods
  + *Ranking/weighting*: weight vector manipulation (abs, scale, non-finite management)
  + *Thresholding in ranking/weighting*:cutoff and operator-based hard thresholding
  + *Nuisance correction*: ComBat application to unseen batches.
* **Visualization**
  + New imaging viewer (overlay\_nifti\_gui.m) that replaces old viewer. Allows for 2D (axial, coronal, sagittal) and 3D viewing modes, neuroanatomical labels and ROI demarcation
  + Improvements for DCA and calibration curve analysis (probability calibration of decision scores for non-probabilistic models)
  + Component-specific pattern analysis for dimensionality-reduction based models based on the Hungarian algorithm (to re-order components)
  + Improvements in the non-imaging bar plot visualization (different ordering options, different customizable colours for positive/negative weights, scaling of colours according to weights
  + New **FeatureRelevanceGUI** in the Results Viewer allows to plot a non-imaging relevance metric for a given modality across multiple analyses or different modalities from one early-fusion or intermediate fusion analysis.