

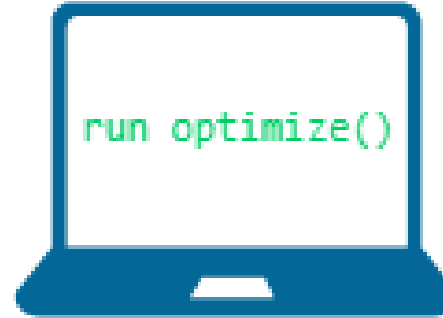


Hyperparameter Tuning & Miscellaneous Topics

Hyperparameters vs Parameters



Hyperparameters



Parameters



Score

- ⚙️ `n_layers = 3`
`n_neurons = 512`
`learning_rate = 0.1`
- ⚙️ `n_layers = 3`
`n_neurons = 1024`
`learning_rate = 0.01`
- ⚙️ `n_layers = 5`
`n_neurons = 256`
`learning_rate = 0.1`



Weights
optimization

Weights
optimization

Weights
optimization

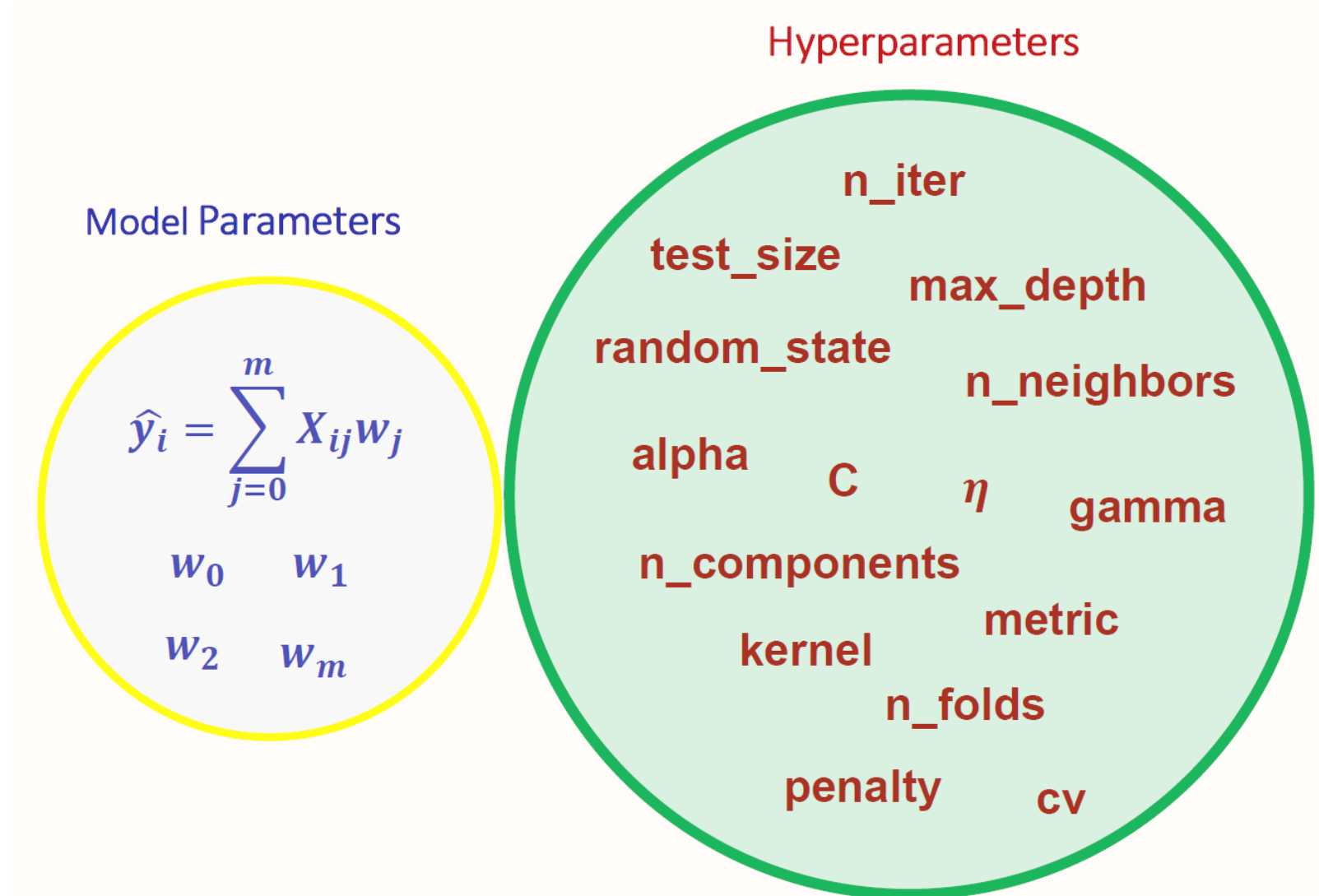


85%

80%

92%

Parameters vs Hyperparameters



Parameters of a Model

A model parameter is a configuration variable that is internal to the model and whose value can be estimated from the given data.

- They are required by the model when making predictions.
- Their values define the skill of the model on your problem.
- They are estimated or learned from data.
- They are often not set manually by the practitioner.
- They are often saved as part of the learned model.
- Some examples of model parameters include: The weights in an artificial neural network.
- The support vectors in a support vector machine.
- The coefficients in a linear regression or logistic regression.

Hyperparameters of a Model

A model hyperparameter is a configuration that is external to the model and whose value cannot be estimated from data.

- They are often used in processes to help estimate model parameters.
- They are often specified by the practitioner.
- They can often be set using heuristics.
- They are often tuned for a given predictive modeling problem.
- *"If you have to specify a model parameter manually, then it is probably a model hyperparameter."*

Some examples of model hyperparameters include:

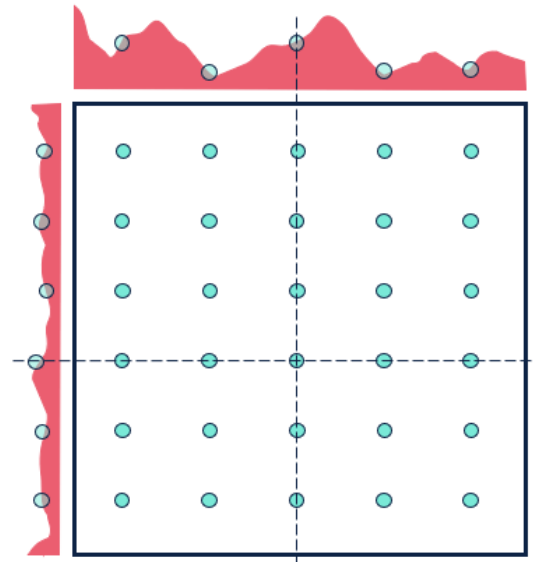
- The learning rate for training a neural network.
- The C and sigma hyperparameters for support vector machines.
- The k in k-nearest neighbors.

Hyperparameter Optimization

- Models can have many hyperparameters and finding the best combination of parameters can be treated as a search problem.
- Although there are many hyperparameter optimization/tuning algorithms now, this post discusses two simple strategies:
 - Grid Search
 - Random Search

Grid Search

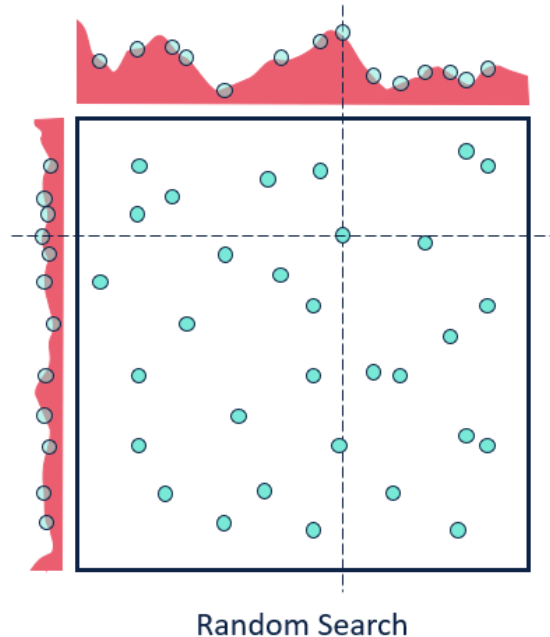
- **Grid searching of hyperparameters:**
- Grid search is an approach to hyperparameter tuning that will methodically build and evaluate a model for each combination of algorithm parameters specified in a grid.



Grid Search

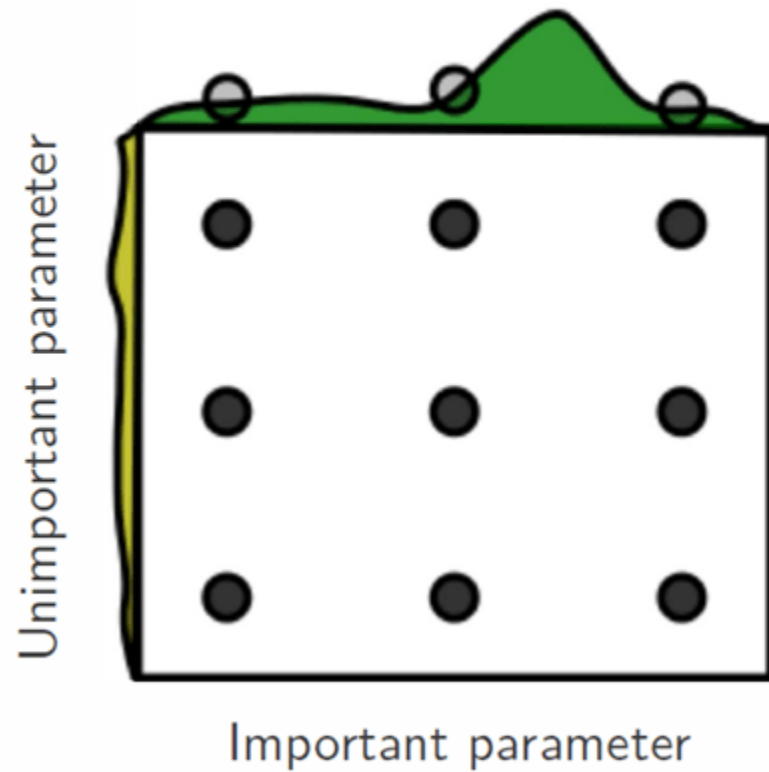
Random Search

- Random search differs from a grid search. In that you no longer provide a discrete set of values to explore for each hyperparameter; rather, you provide a statistical distribution for each hyperparameter from which values may be randomly sampled.

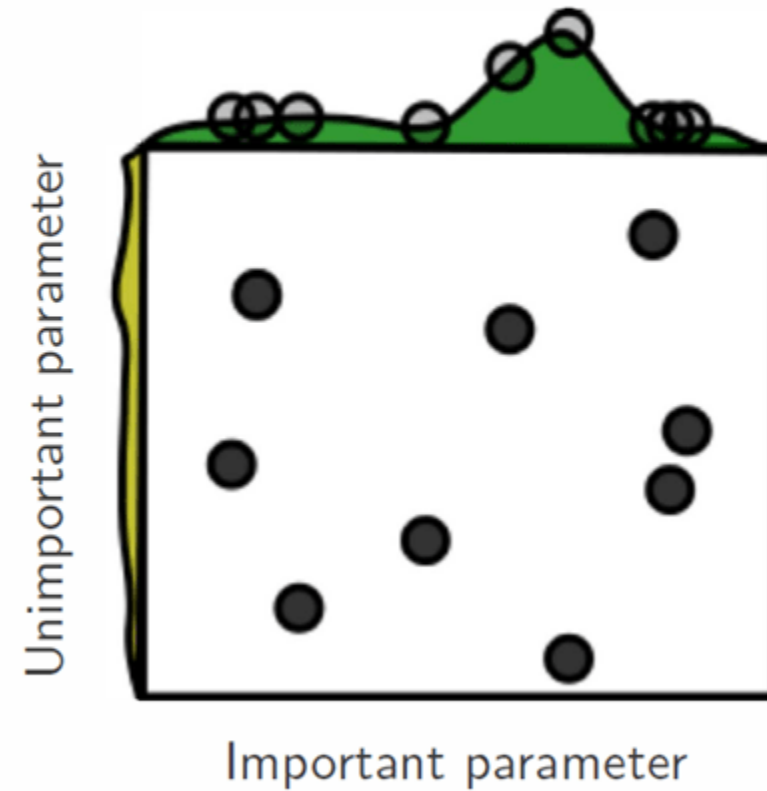


Search

Grid Layout



Random Layout



Other Optimization Strategies

- Bayesian optimization
 - Gradient-based optimization
 - Evolutionary optimization
 - Population-based
-
- In sklearn refer
 - https://scikit-learn.org/stable/modules/grid_search.html



Random Sampling

Need of Sampling

Downsampling and Upsampling

Downsampling

A strategy to handle imbalanced classes by creating a random subset of the majority of equal size to the minority class.

ChrisAlbon

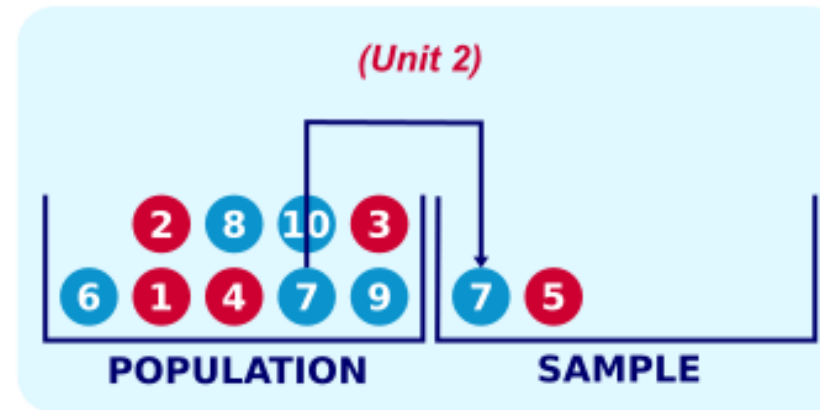
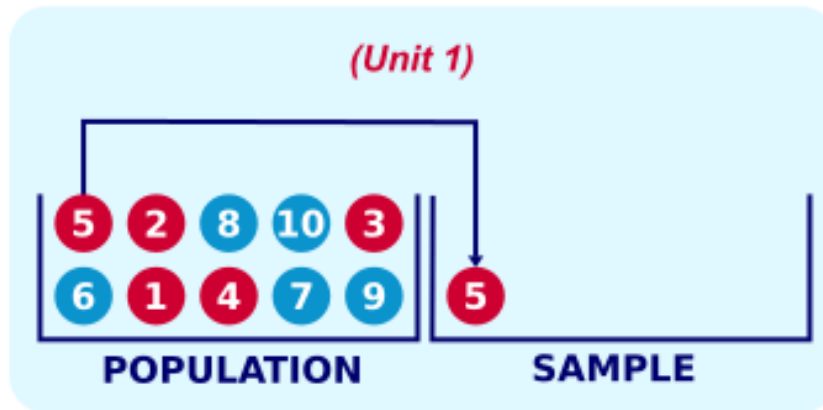
UPSAMPLING

A strategy to handle imbalanced classes by repeatedly sample with replacement from the minority class to make it of equal size as the majority class.

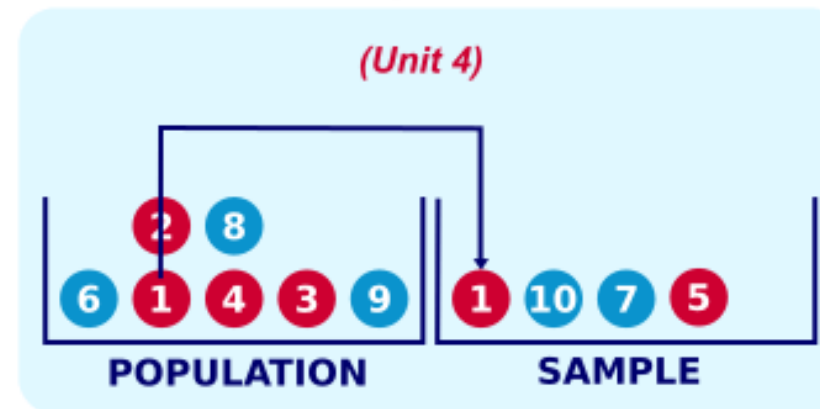
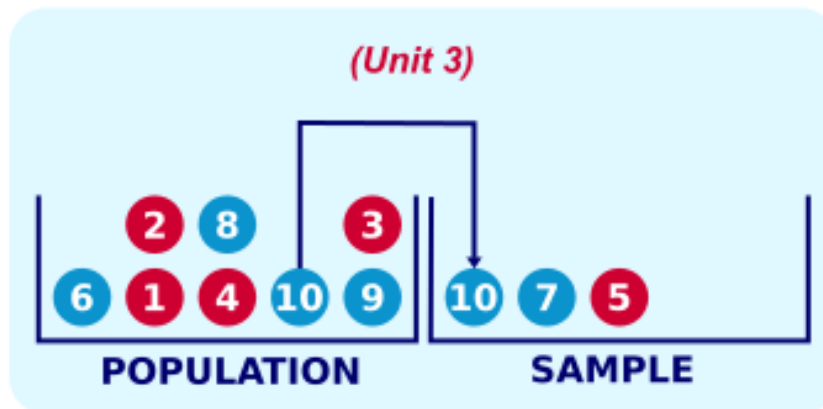
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Random Sampling without Replacement

SIMPLE RANDOM SAMPLING *WITHOUT* REPLACEMENT

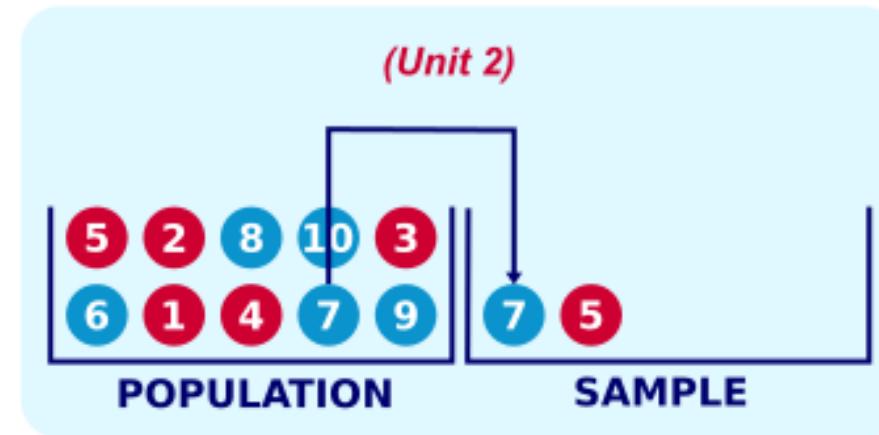
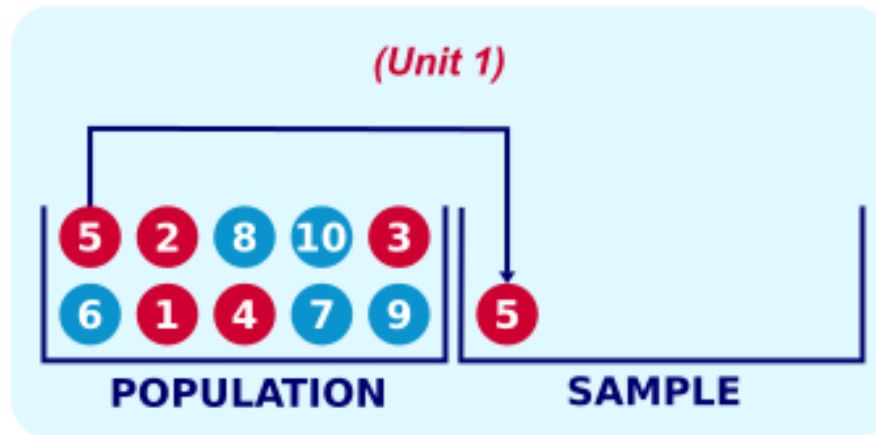


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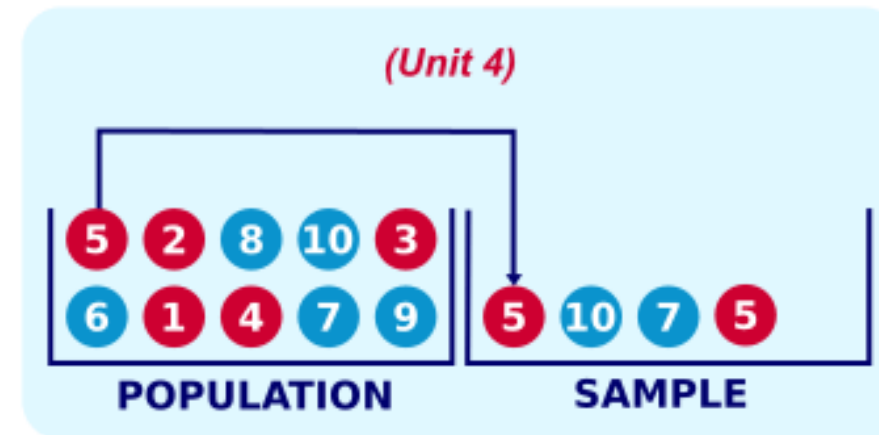
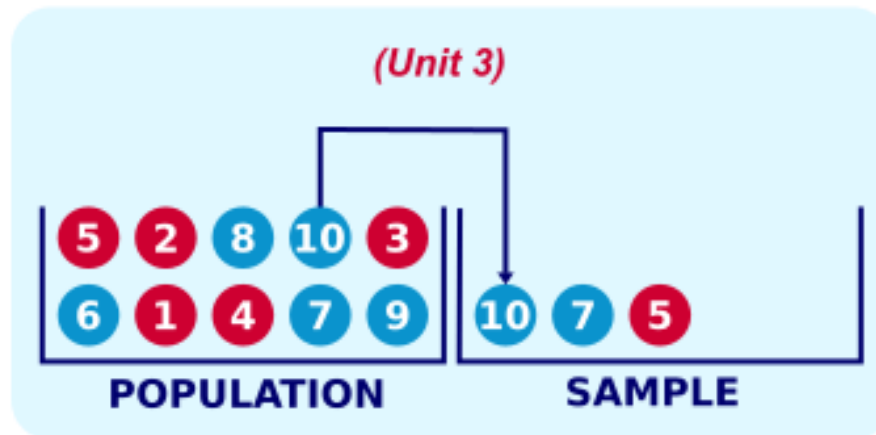


Random Sampling with Replacement

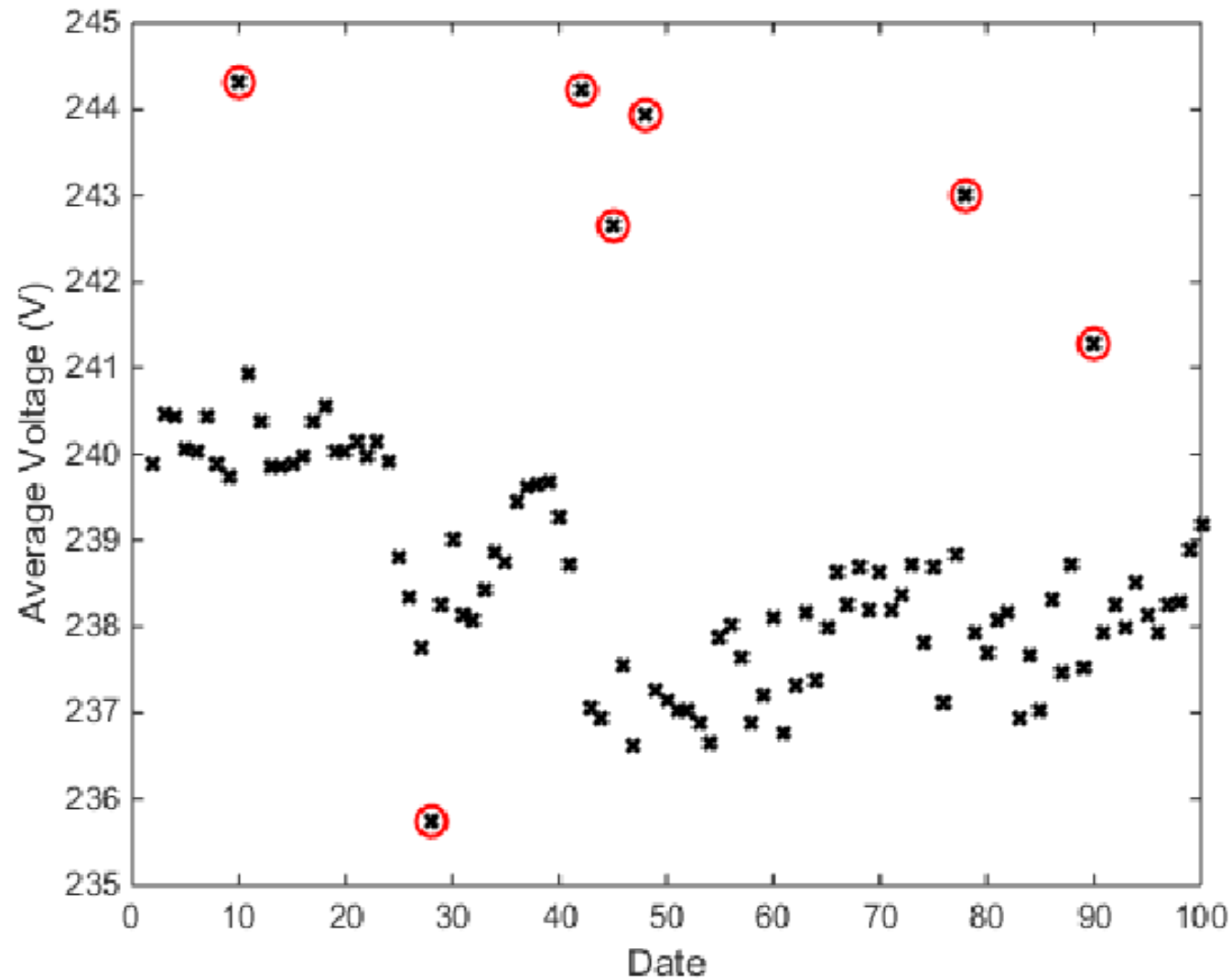
SIMPLE RANDOM SAMPLING *WITH* REPLACEMENT



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Outliers



Handling Outliers

OUTLIER

DROP

Not a great option. We lose lots of information. Find out if genuine extreme value or broken sensor.

MARK

Safest option. We can see if the outliers had an effect.

RESCALE

Log values so outliers don't have as great an effect.

Chris Albon

Vanakkam !

