

Lessons Learned in Spike Sorting: The $n = 1$ Perspective

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June 21, 2013

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- ▶ January 2013–February 2013: Trying to optimize
- ▶ March 2013–June 2013: Improving merge deliberation

Changing allcluststdev (Mouse 5 Jun14a)

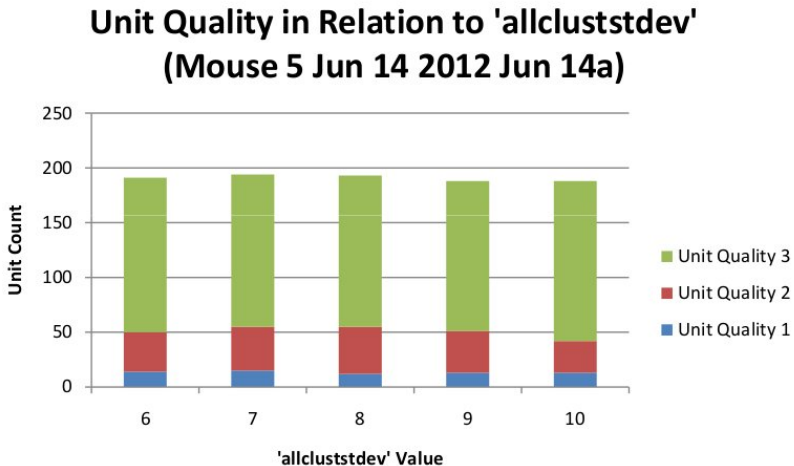
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- ▶ Doing unit quality by hand on the same dataset again and again is tedious and prone to inconsistency

This Figure is Really Old (Mouse 5 Jun14a)



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- ▶ What worked? SNR!
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Auto-Unit Quality/Semi-automatic Unit Quality and Quasi-SNR

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 - ▶ Qualifier that works well: restricting consideration to points near the peak of the spike

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- ▶ The process can be confused by high-SNR artifacts/non-units that would be caught by a human
- ▶ Best use case for auto-unit quality?
 - ▶ Consistent scoring of different sorting algorithms

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► Observations

- get_penultimate merges are usually not very significant
- bulk of merges are done in get_final_units

Applying lessons learned with `mergecluststdev`: merges
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 1. Mahalanobis Distance
 2. Principal Component Analysis

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- ▶ Principal component analysis (PCA) allows us to transform each spike into 47 data points of decreasing significance, so a comparing e.g. only the first three dimensions becomes reasonable (we go from \mathbb{R}^{47} to \mathbb{R}^3)

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 5. Consider the distance between the clusters to decide if the two units should be merged (the smaller the distance between the clusters of two units, the more likely they should be merge)

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 - ▶ Normalize the data using z-scores
- ▶ The PCA merge process is more sensitive to “garbage units” than the old Euclidean-distance based merge process
 - ▶ Use intensive garbage-discarding/ “sanity-checks” —`get_sane`