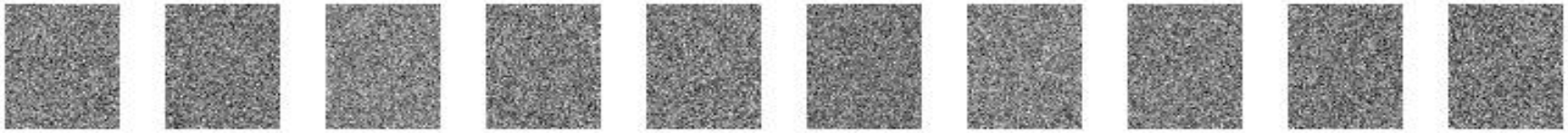
Module 21:
More Multiple Comparisons

Example

Signal

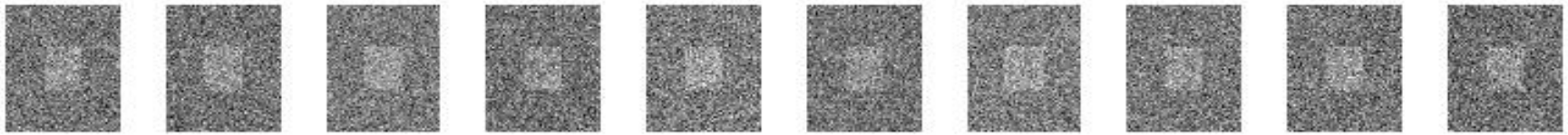
+

Noise

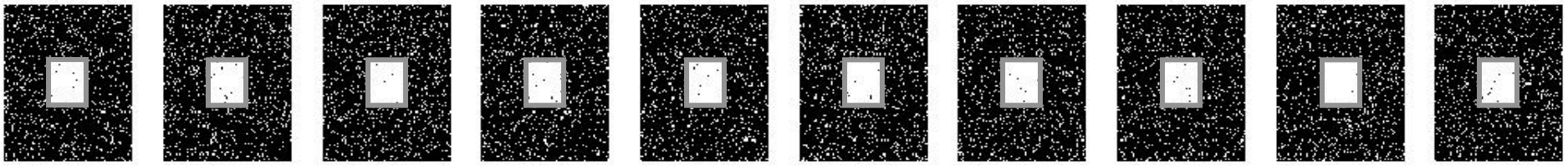


=

Signal + Noise



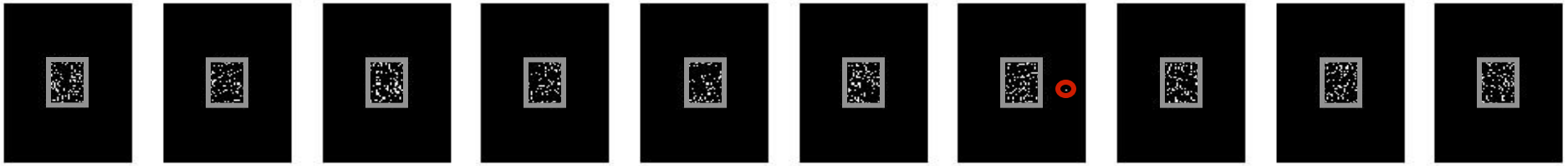
α=0.10, No correction



0.0974 0.1008 0.1029 0.0988 0.0968 0.0993 0.0976 0.0956 0.1022 0.0965

Percentage of false positives

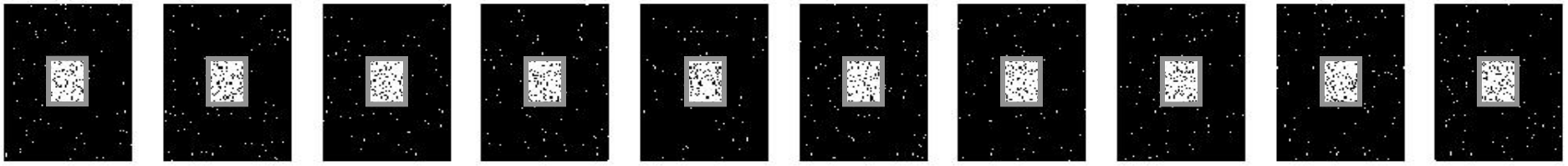
FWER control at 10%



FWER

Occurrence of false positive

FDR control at 10%



0.0871 0.0952 0.0790 0.0908 0.0761 0.1090 0.0851 0.0894 0.1020 0.0992

Percentage of active voxels that are false positives

Uncorrected Thresholds

- Most published PET and fMRI studies use arbitrary uncorrected thresholds (e.g., $p<0.001$).
  - A likely reason is that with available sample sizes, corrected thresholds are so stringent that power is extremely low.

- Using uncorrected thresholds is problematic when interpreting conclusions from individual studies, as many activated regions may be false positives.

- Null findings are hard to disseminate, hence it is difficult to refute false positives established in the literature.

Extent Threshold

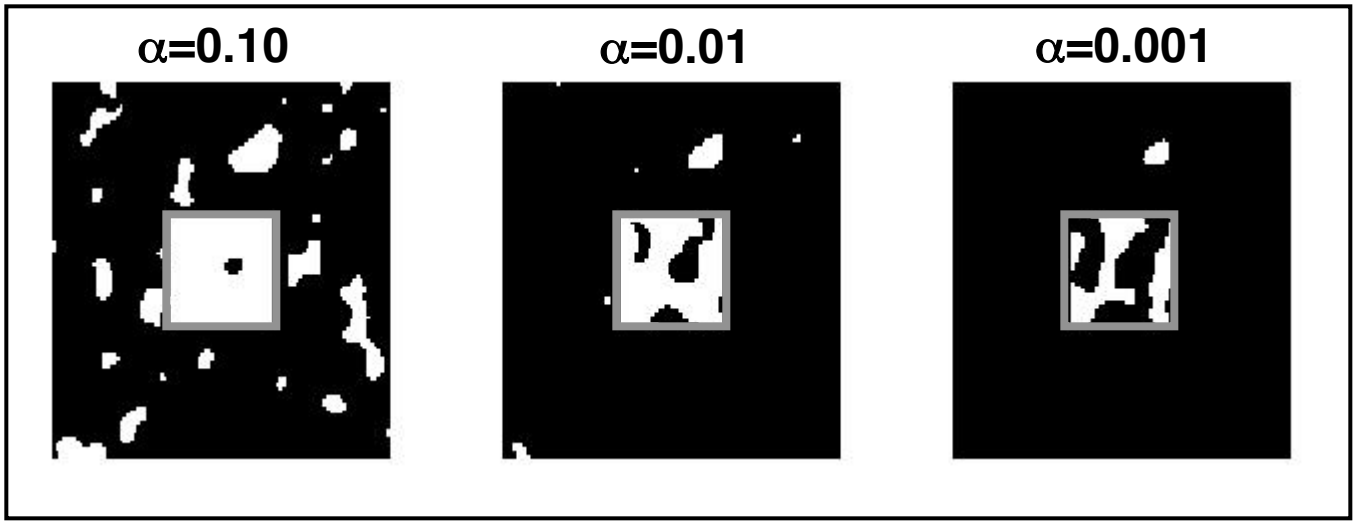
- Sometimes an arbitrary extent threshold is used when reporting results.

- Here a voxel is only deemed truly active if it belongs to a cluster of k contiguous active voxels (e.g., $p<0.001$, 10 contingent voxels).

- Unfortunately, this does not necessarily correct the problem because imaging data are spatially smooth and therefore false positives may appear in clusters.

Example

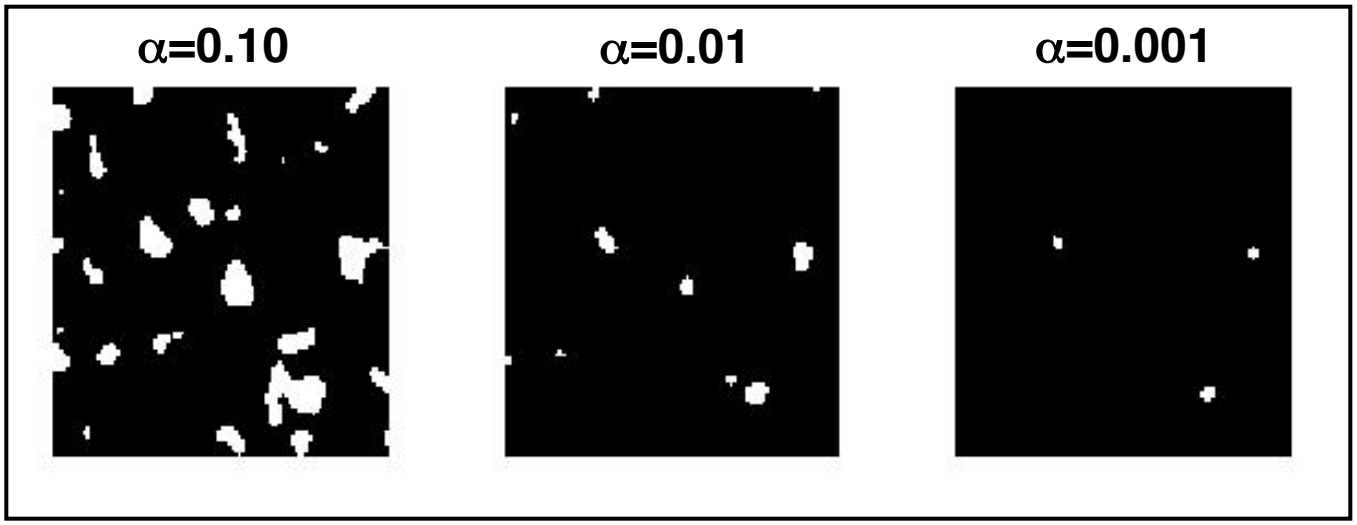
- Activation maps with spatially correlated noise thresholded at three different significance levels. Due to the smoothness, the false-positive activation are contiguous regions of multiple voxels.



Note: All images smoothed with FWHM=12mm

Example

- Similar activation maps using null data.



Note: All images smoothed with FWHM=12mm

End of Module

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