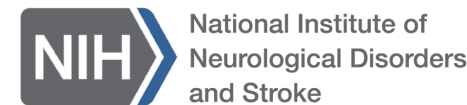


Multifocal Source Localizations from Interictal Epileptiform Discharges (IEDs) and Seizures as Traveling Waves

LaGamma C*, McAuliffe D*, Diamond J, Zaghoul K
IEEE SPMB
December 2023

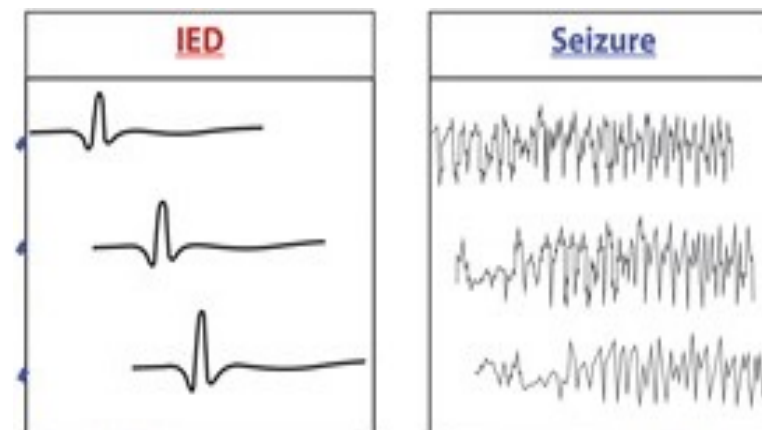
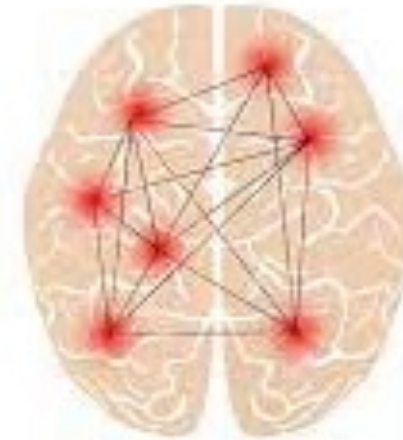


School of Medicine
TEMPLE UNIVERSITY®

Background: Epilepsy

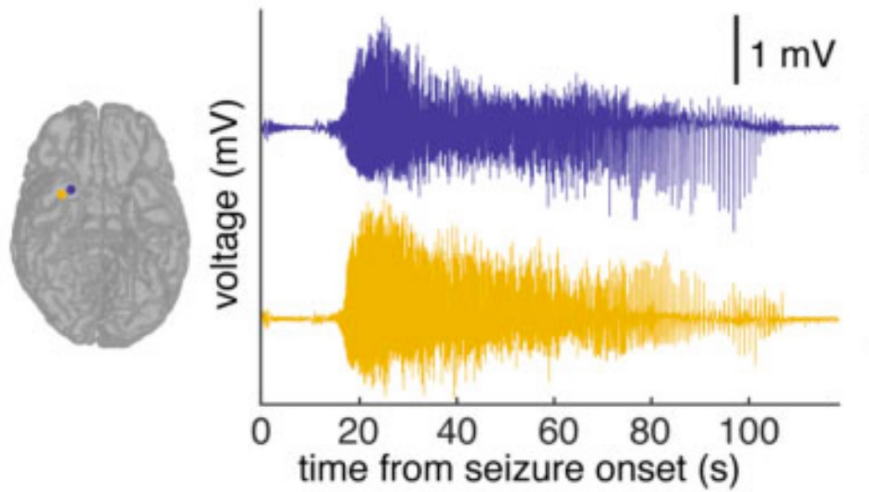
Background: Epilepsy

- Epilepsy is one of the most common neurological diseases
 - 50 million people globally
 - 3.4 million in the US
 - Medically refractory 20-40%
- Successful surgical management of epilepsy is dependent on identifying the SOZ
- IED and Seizure propagation has been shown to spread via traveling waves

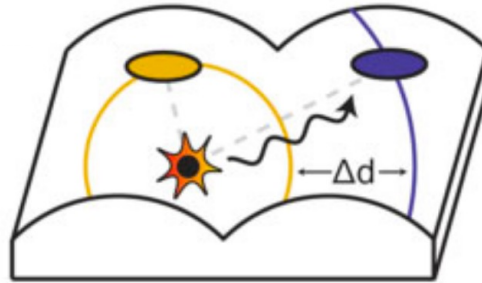
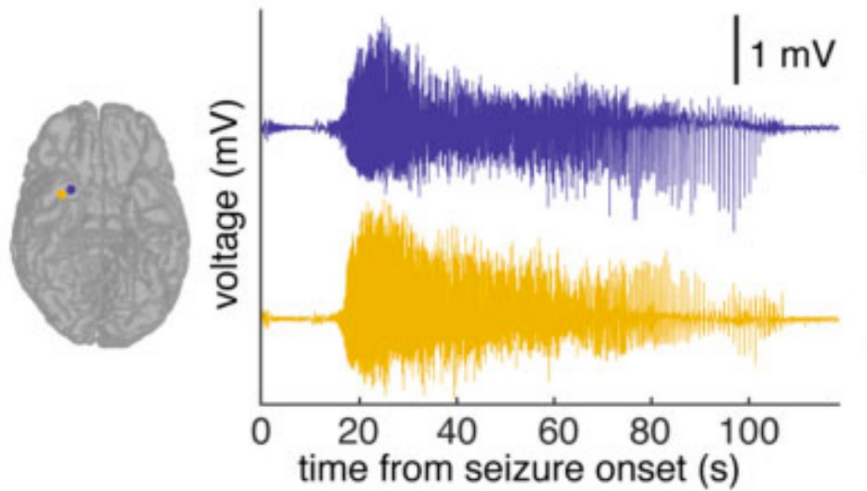


Background: Seizure sources emit traveling waves

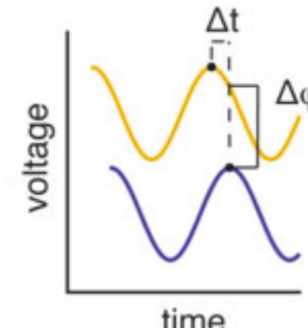
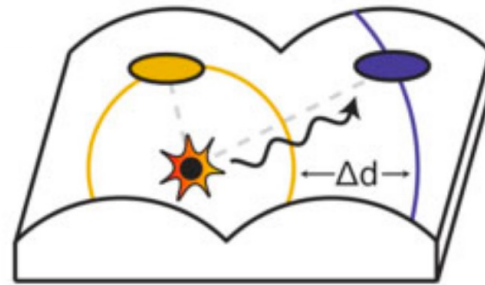
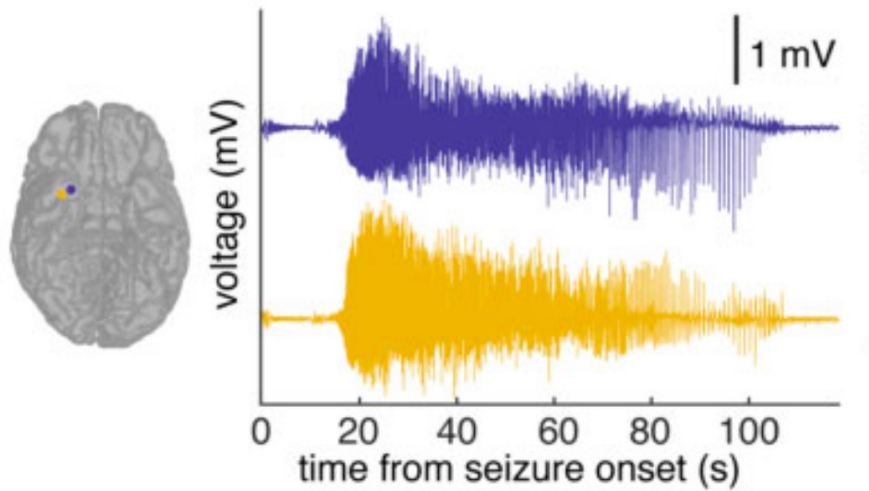
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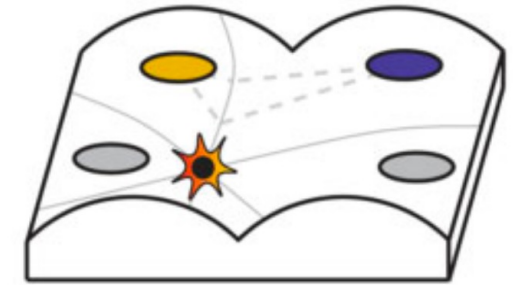
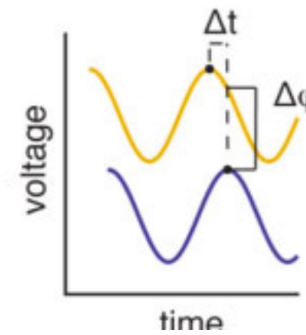
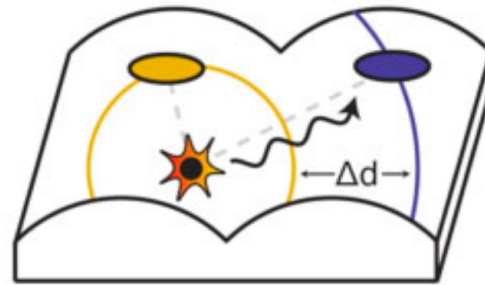
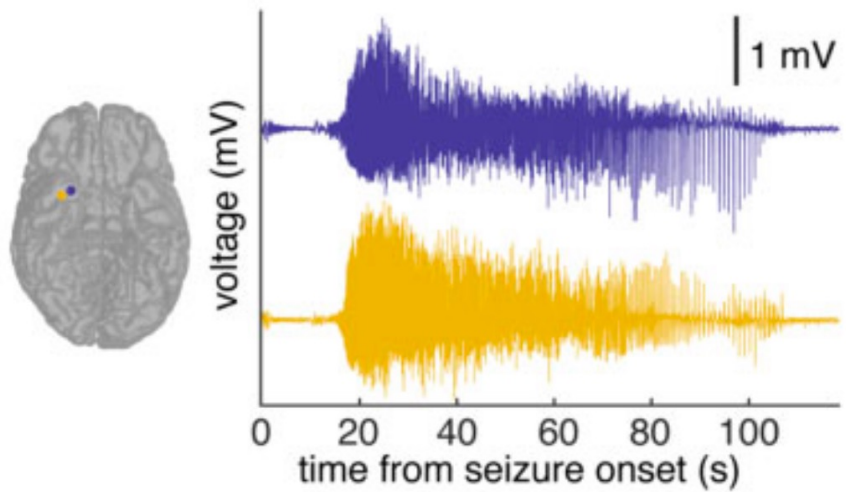
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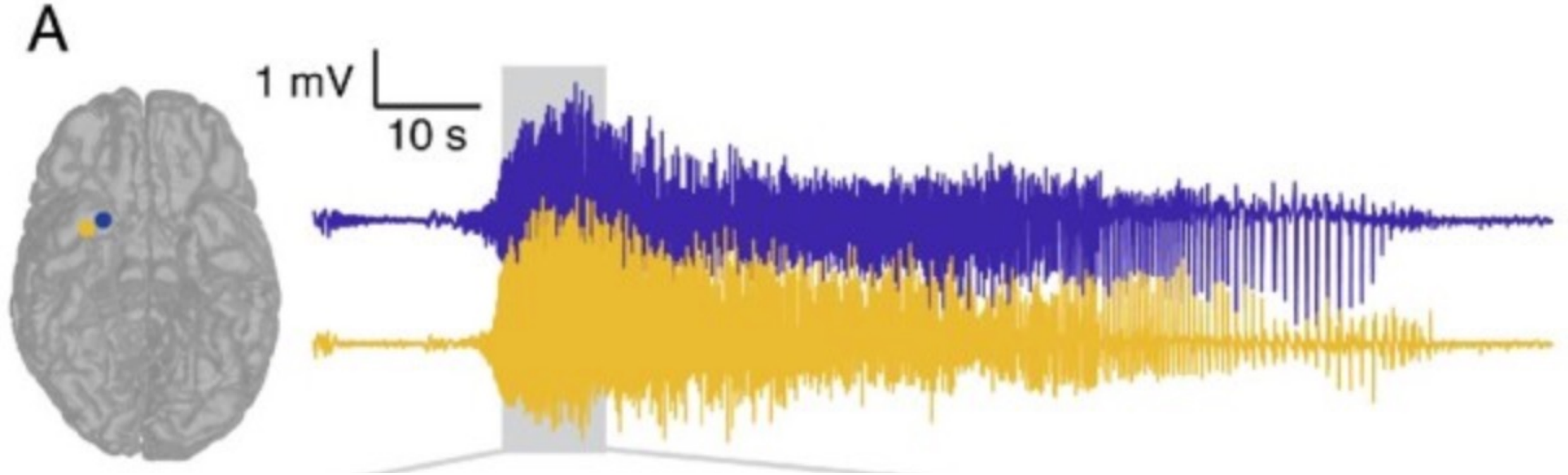


Background: Seizure sources emit traveling waves

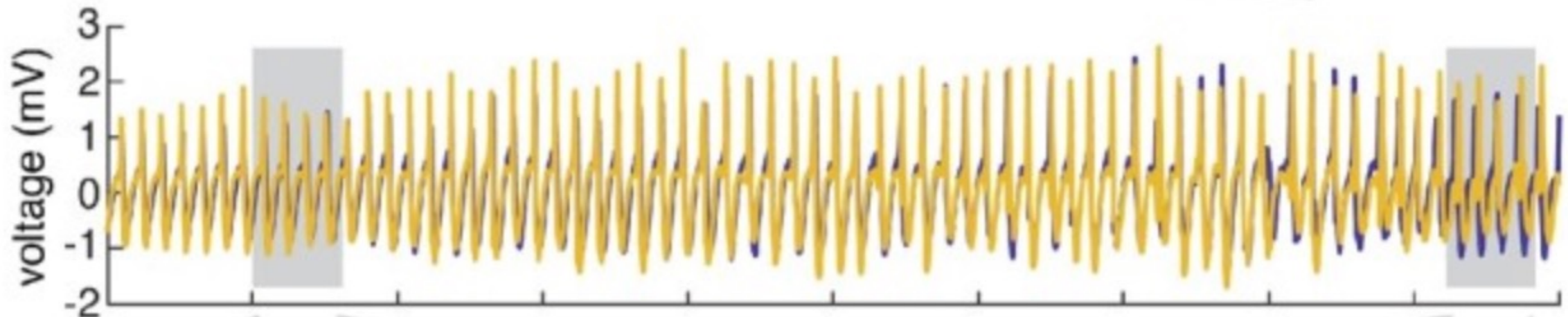


Background: Seizure source is dynamic

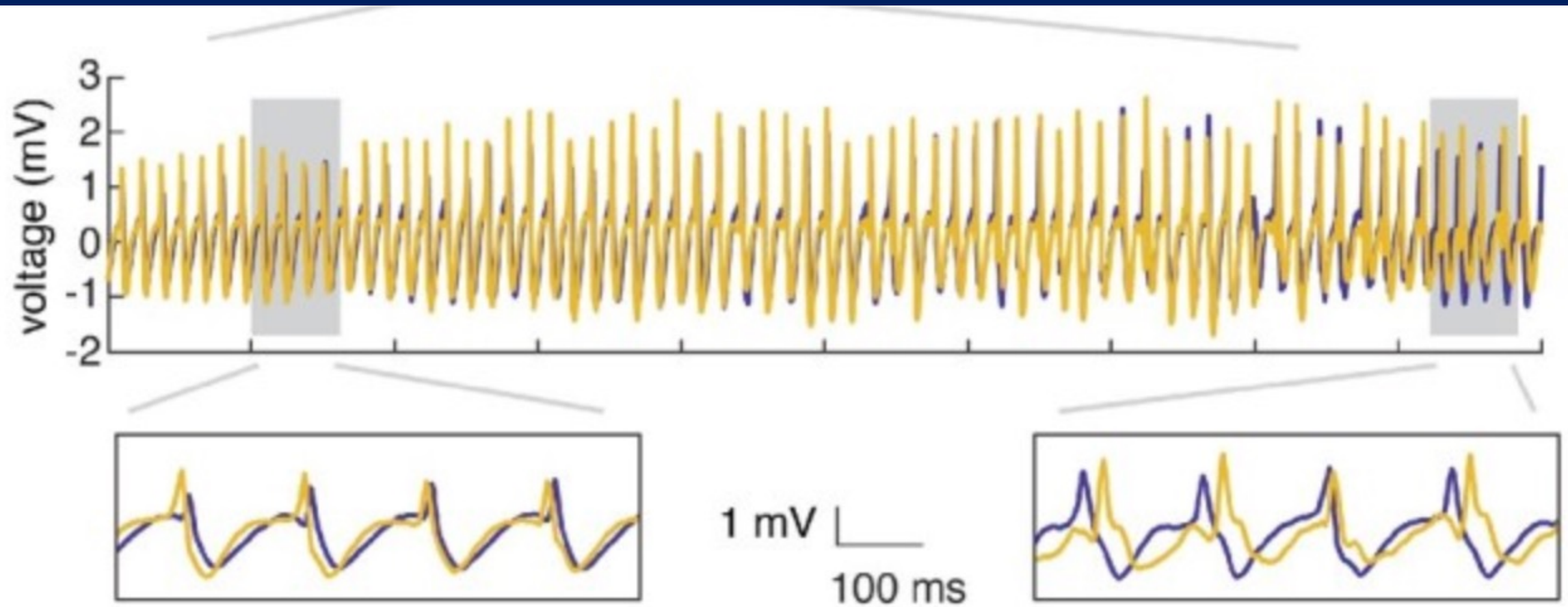
Background: Seizure source is dynamic



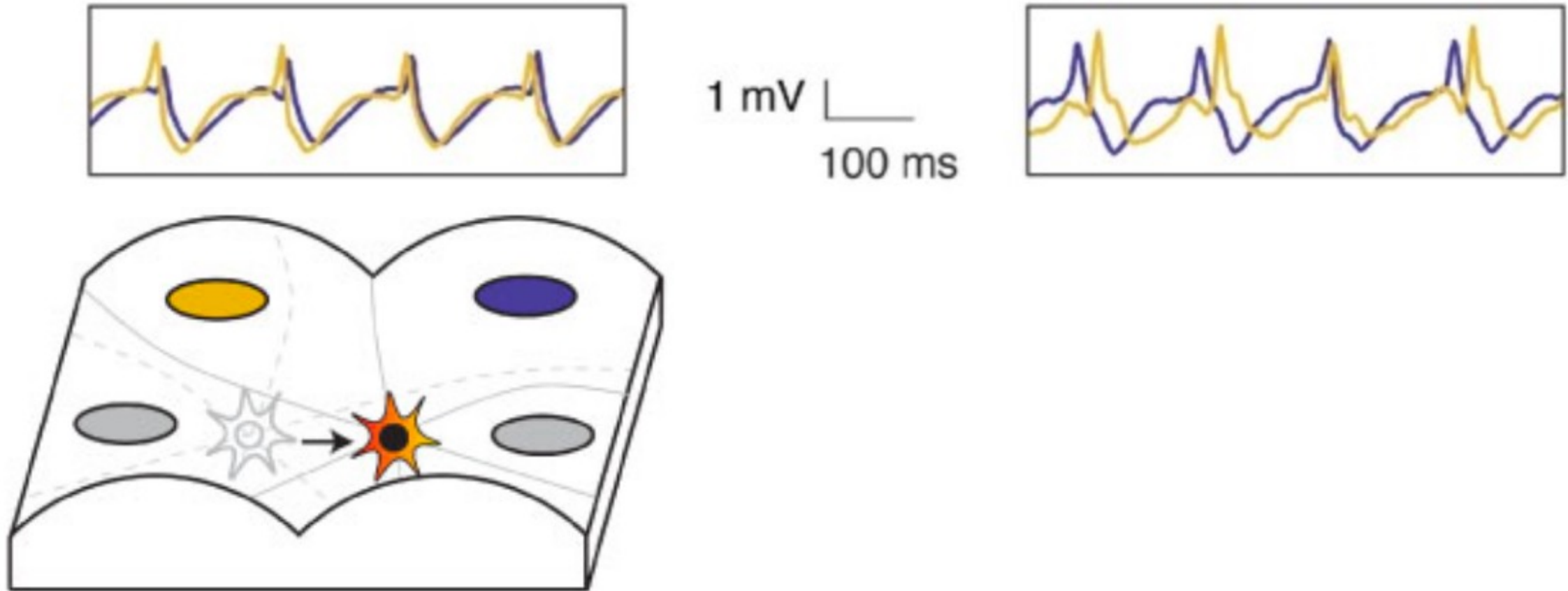
Background: Seizure source is dynamic



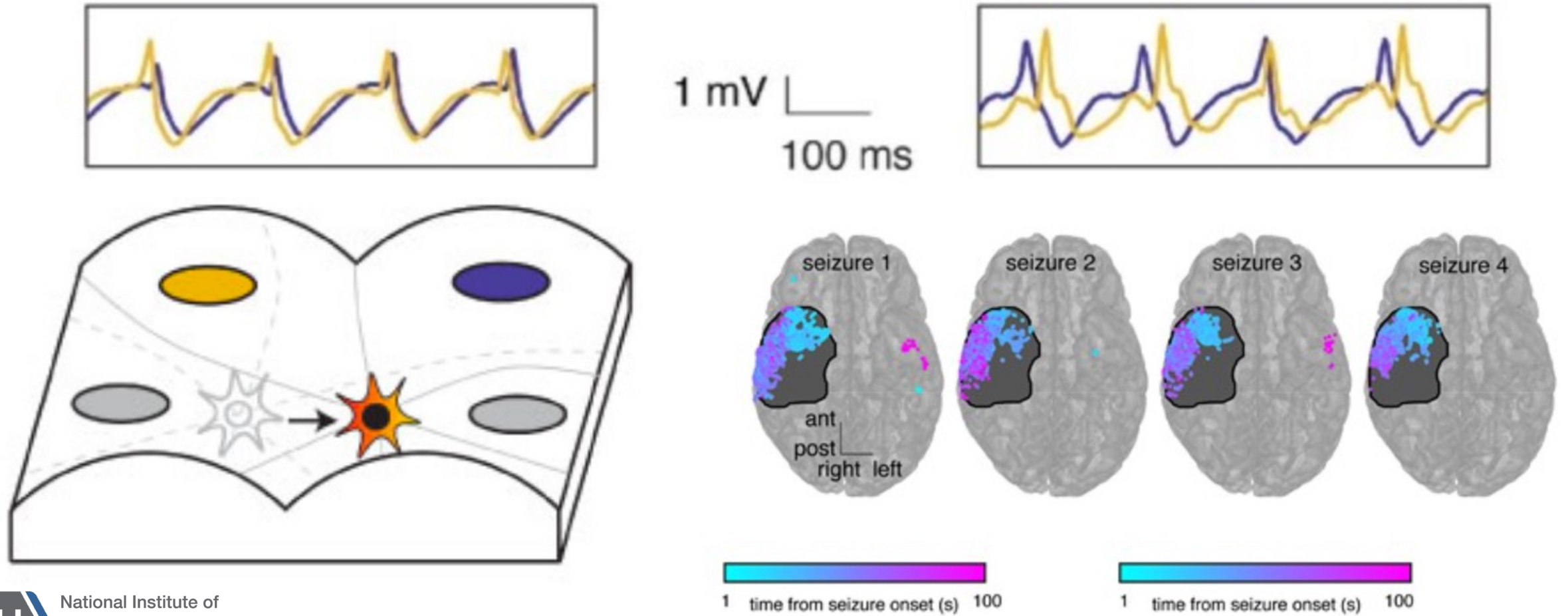
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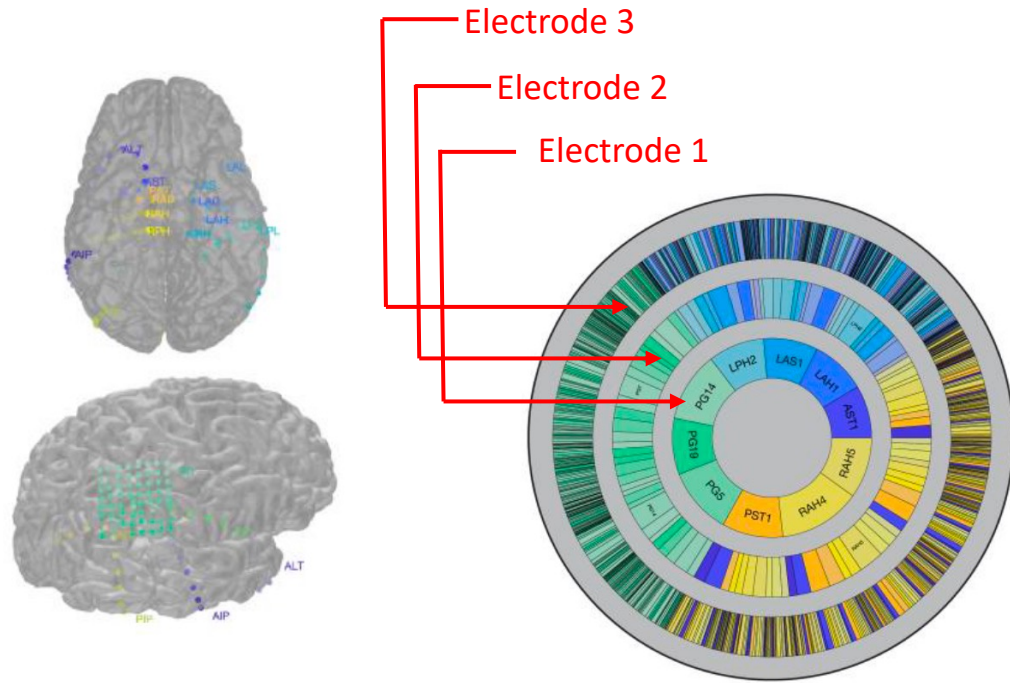


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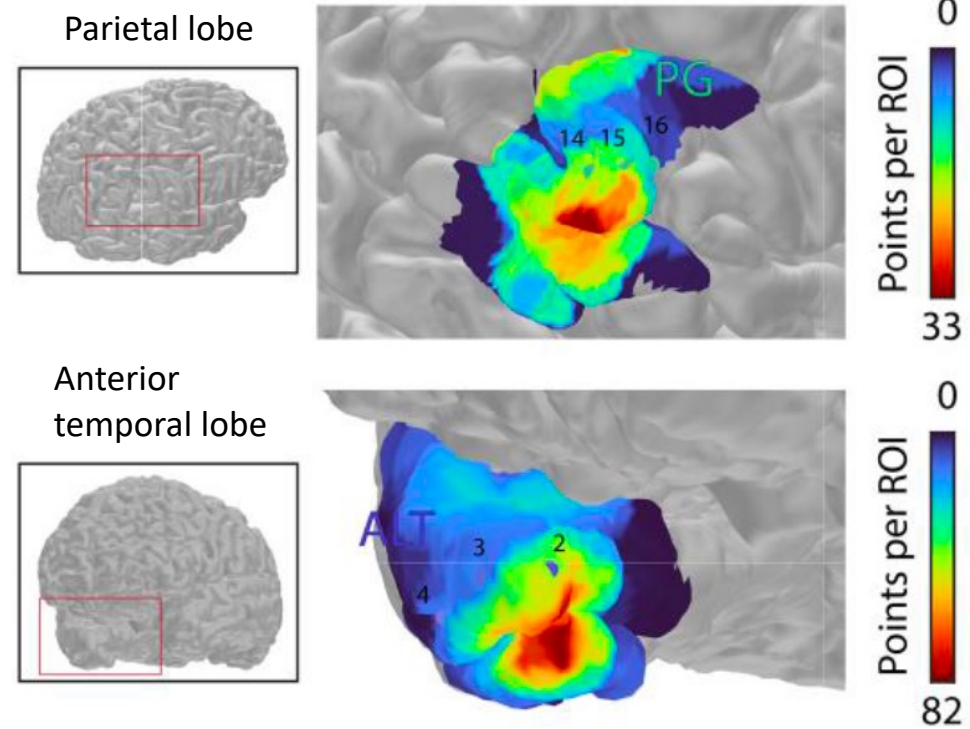
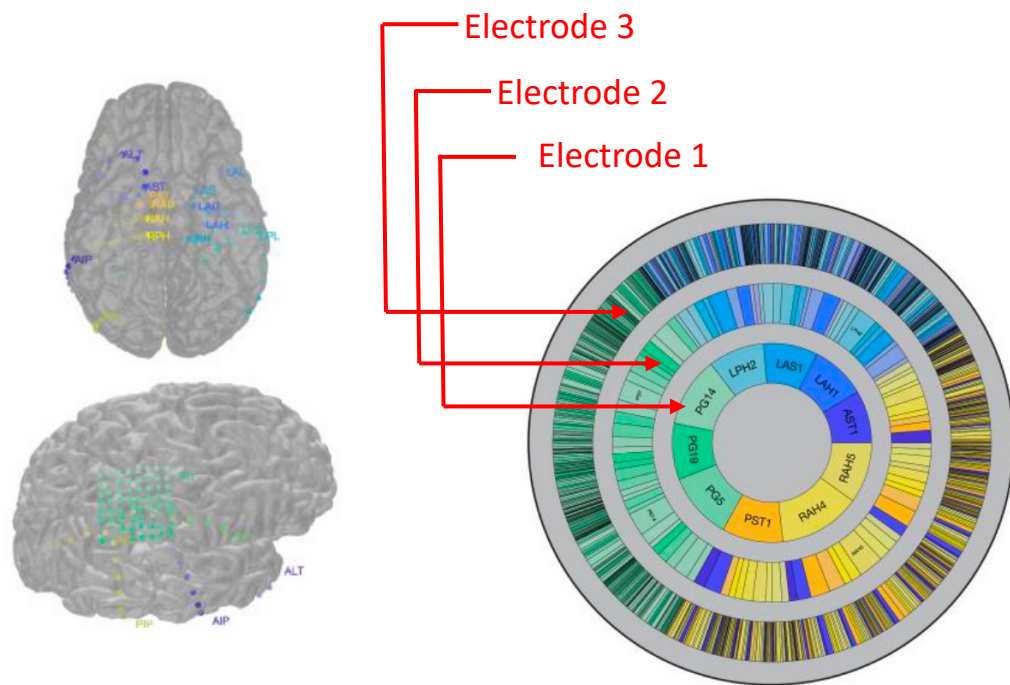


Background: IEDs are stereotyped across electrode recordings

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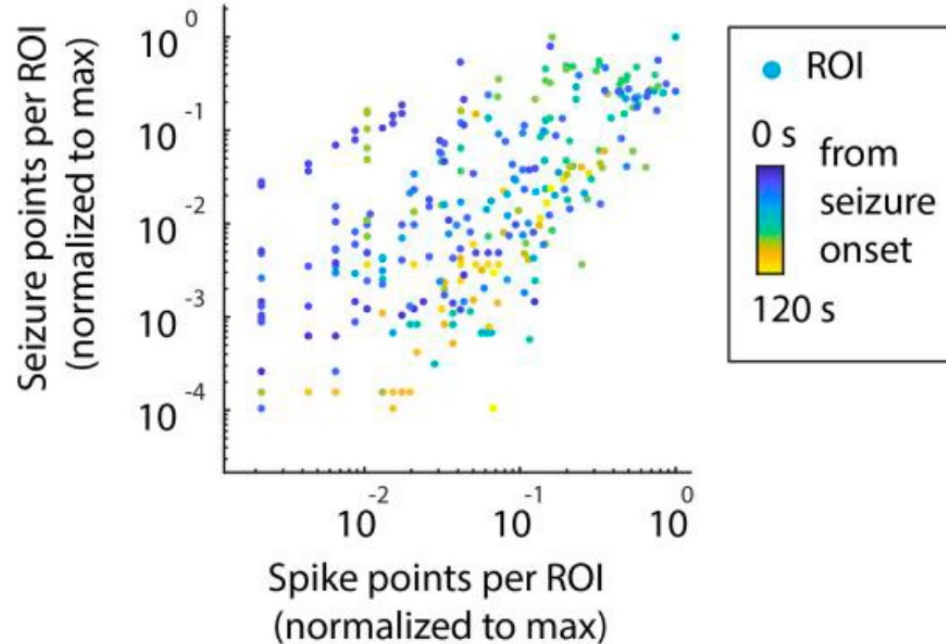


Background: IEDs are stereotyped across electrode recordings and source travels with time

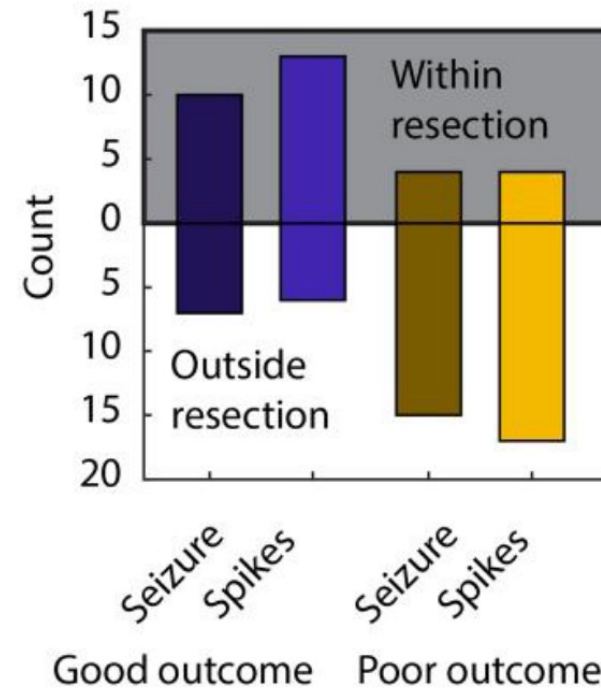
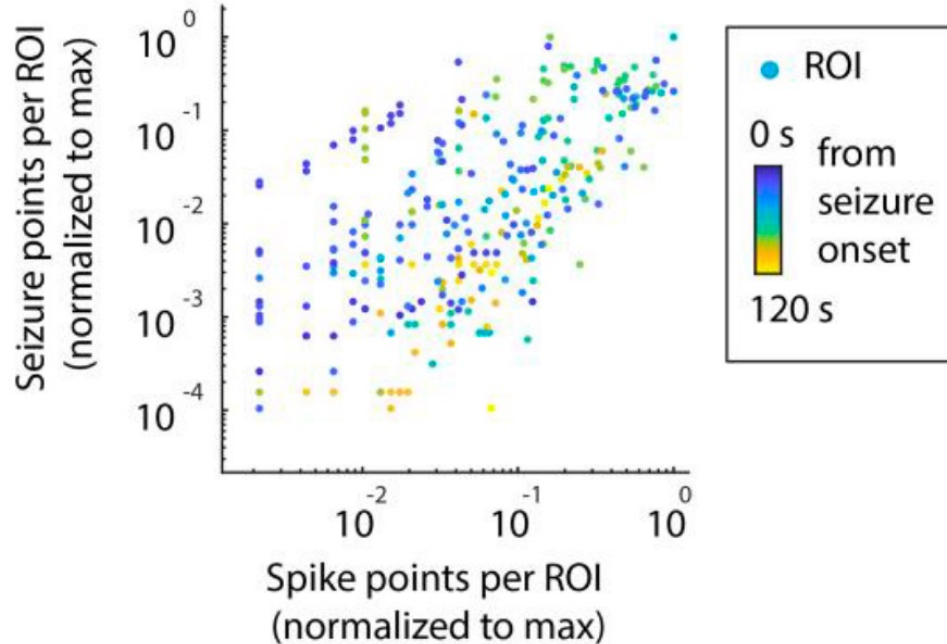


Background: Seizure and IED localizations are correlated

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Background: Seizure and IED localizations are correlated and the extent of resection effects outcomes



Aim 1:

Does Source Localization of IEDs and Seizures reveal multiple foci?

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Aim 2:

Do foci characteristics differ between IEDs and Seizures?

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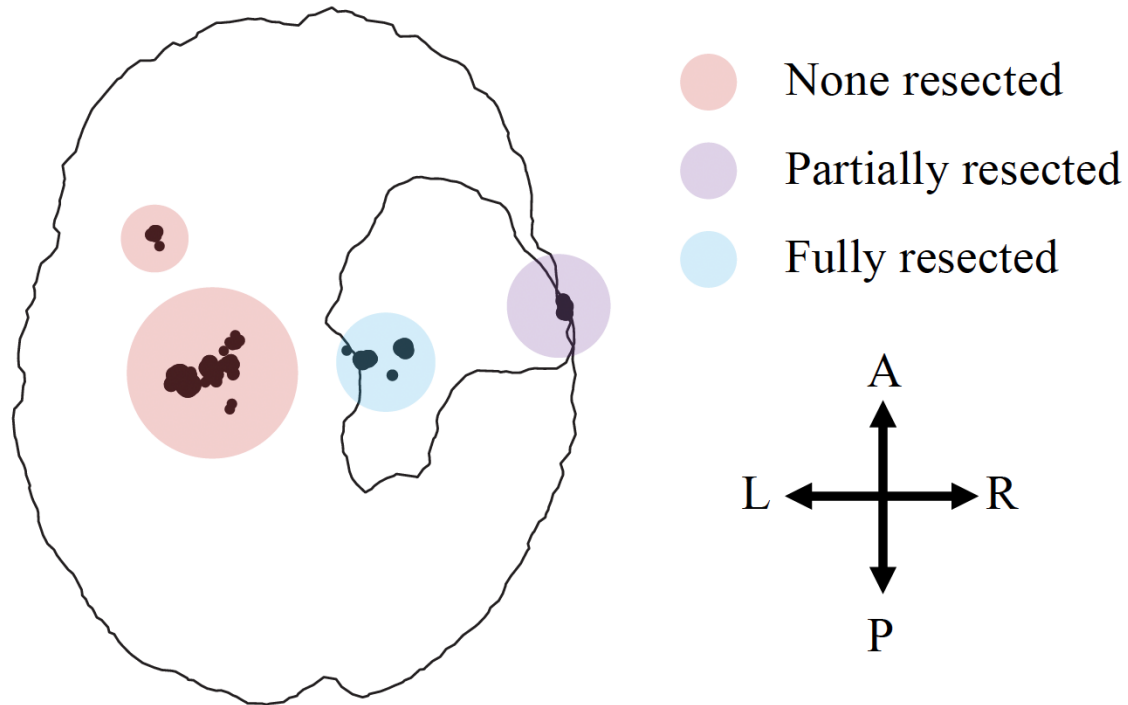
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Aim 3:

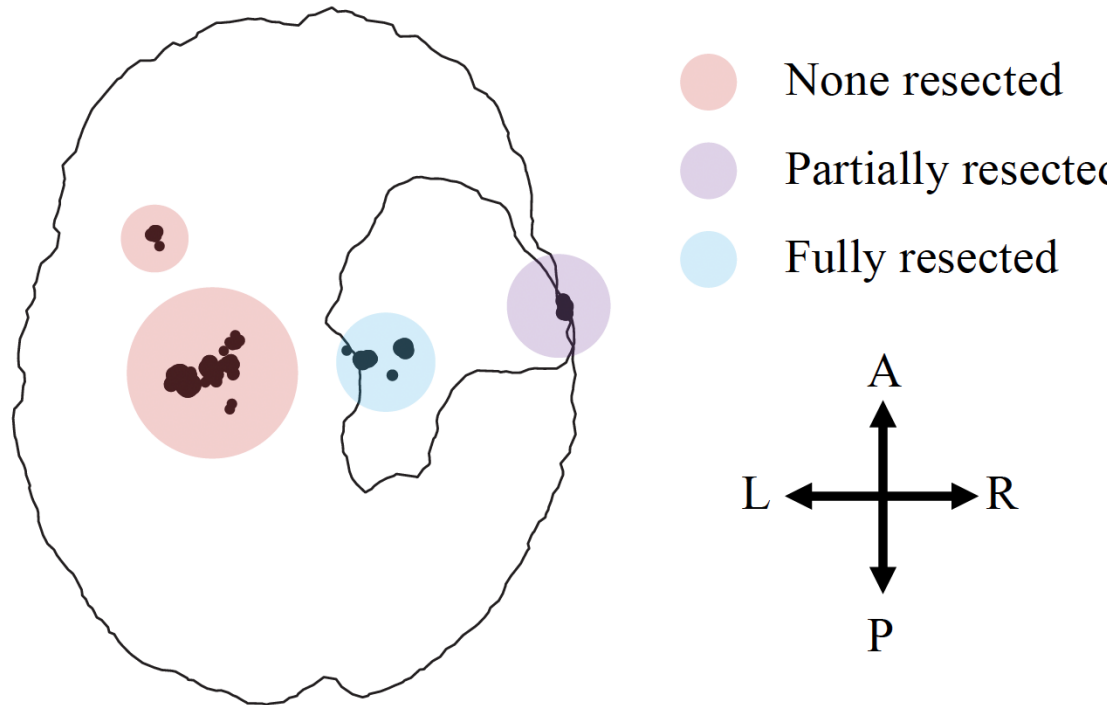
Does Resection of Foci differ between patient outcomes?

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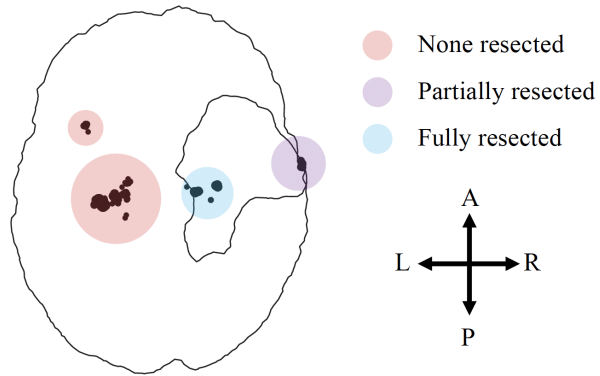


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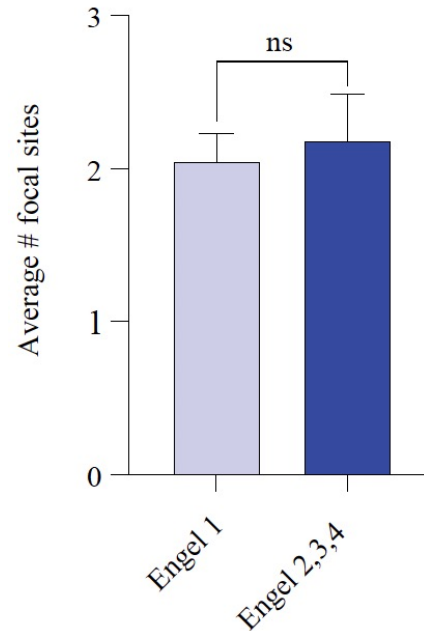


Focus number	Rater 1 score (RS1)	Rater 2 score (RS2)	Average Rater score (ARS)
1	0	0	0
2	0	0	0
3	1	1	1
4	0.5	1	0.75

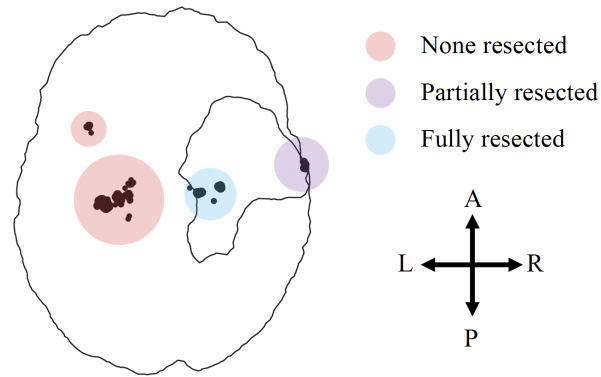
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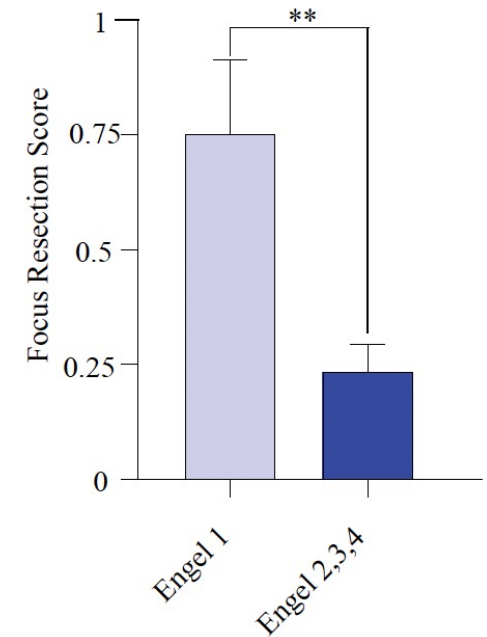
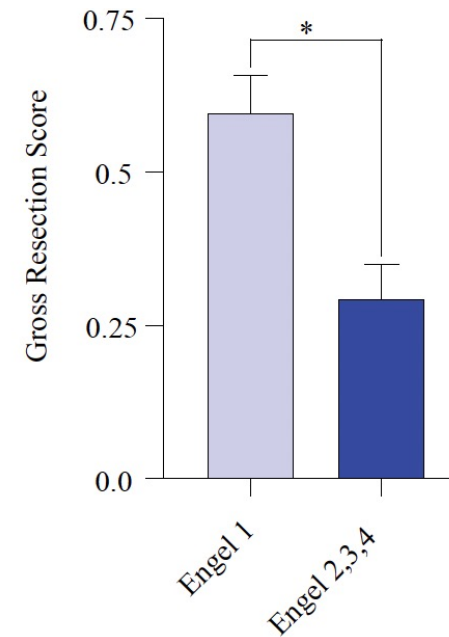
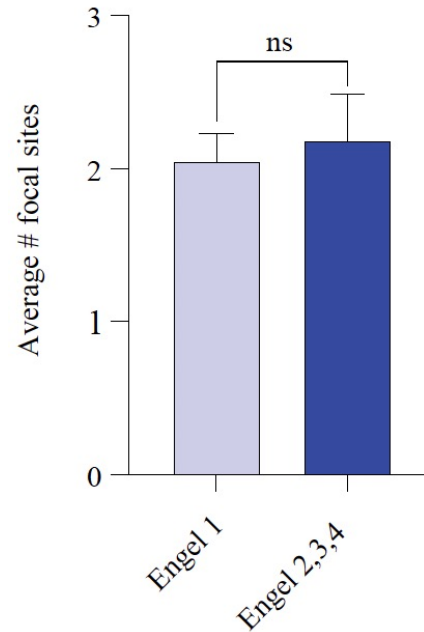
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Seizure Localizations



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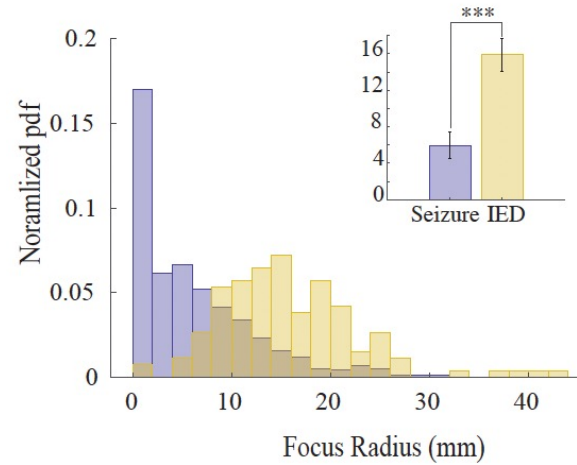
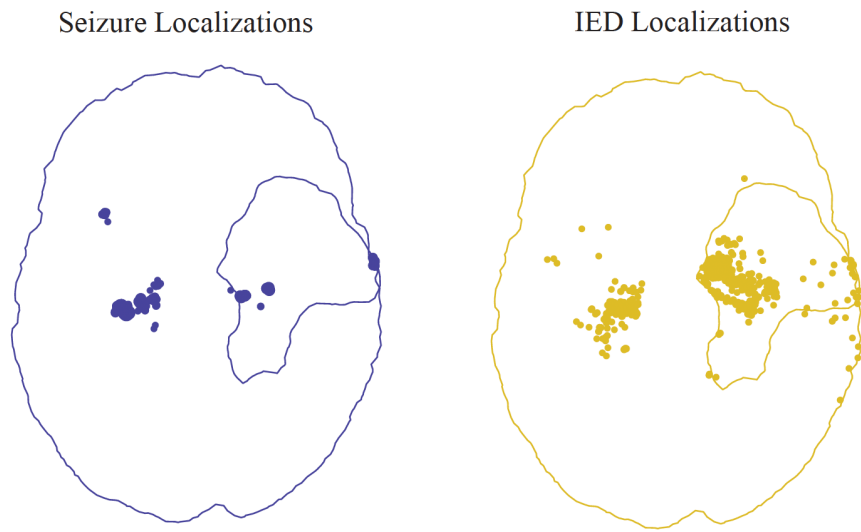
Seizure Localizations



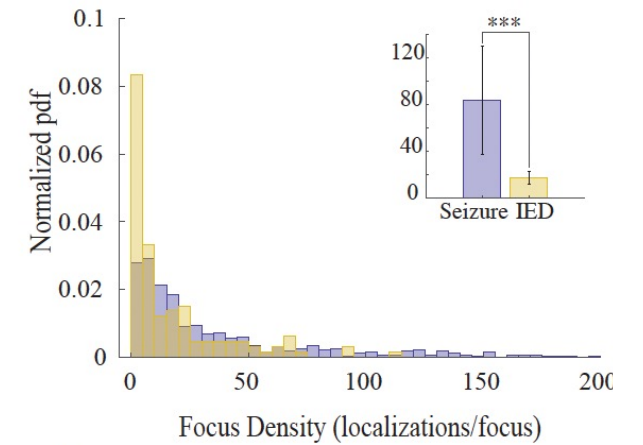
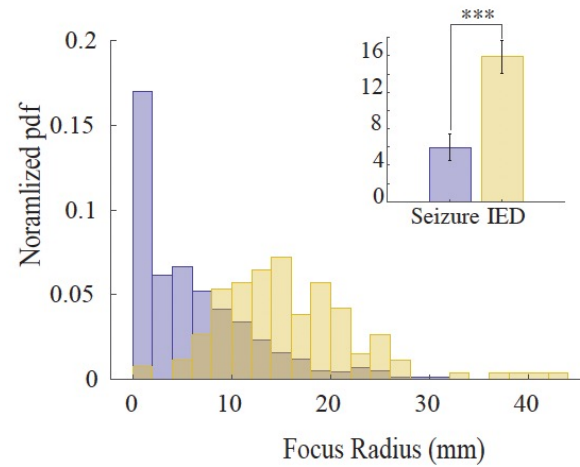
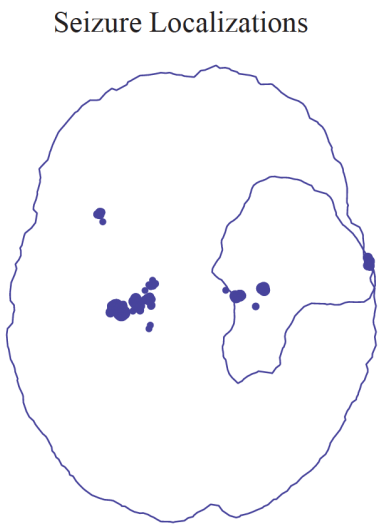
IED Localizations



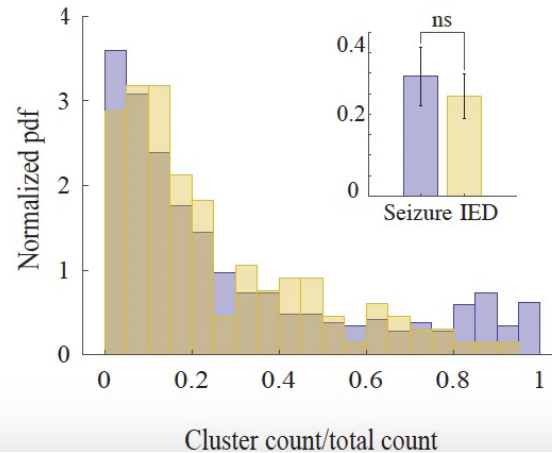
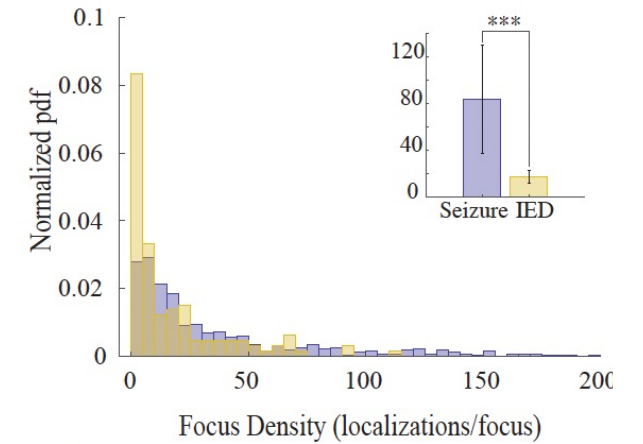
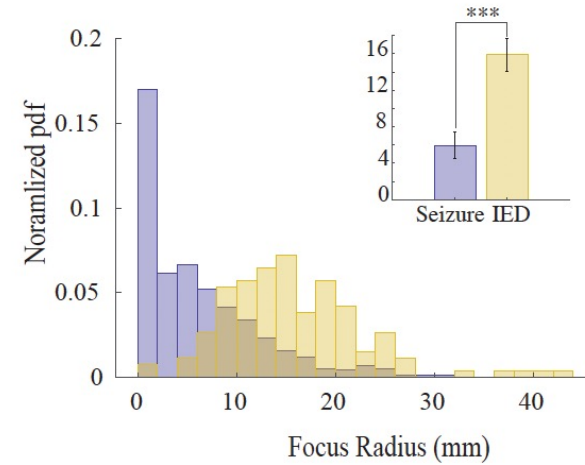
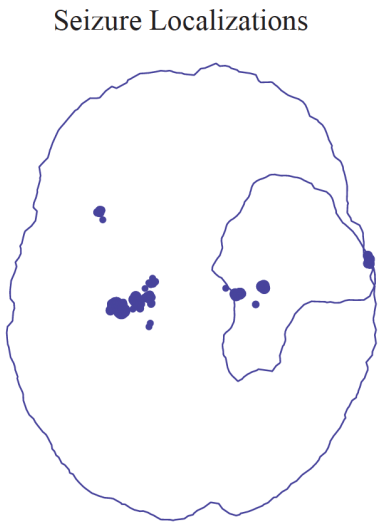
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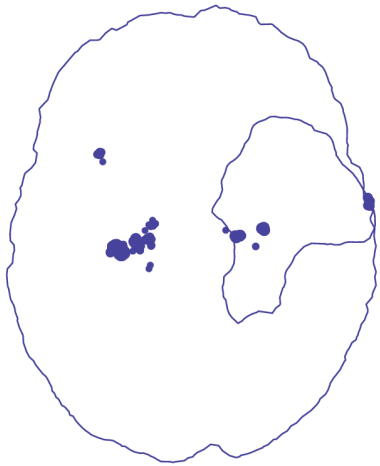


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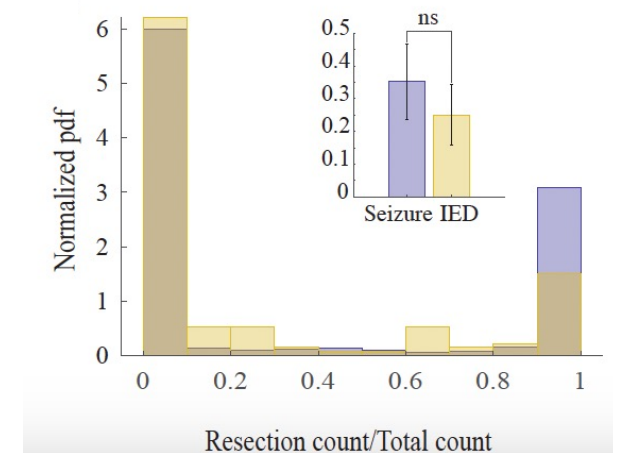
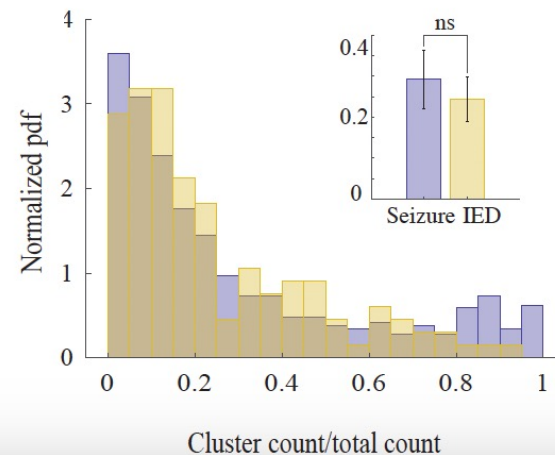
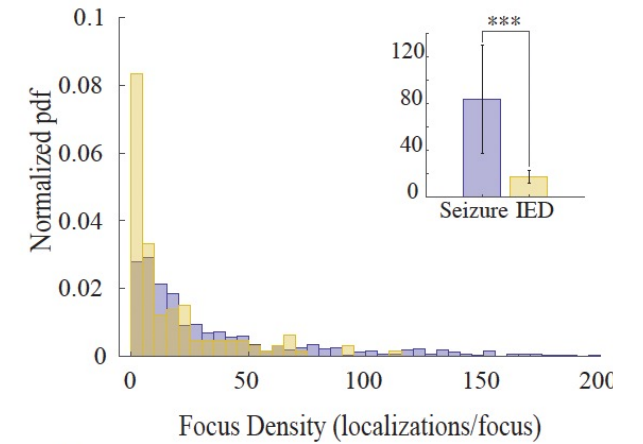
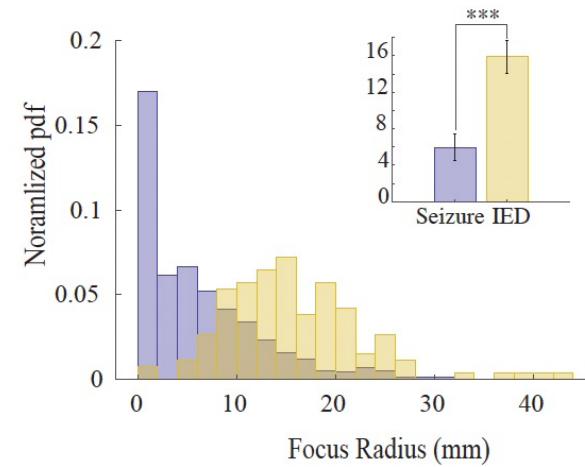


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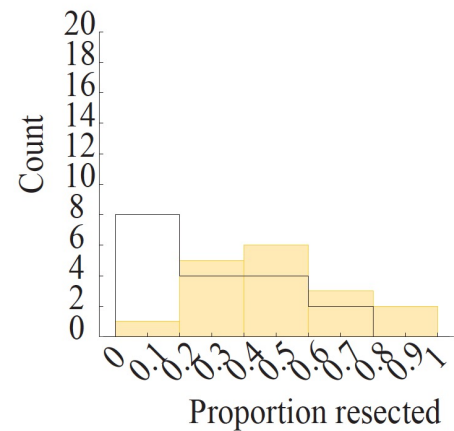
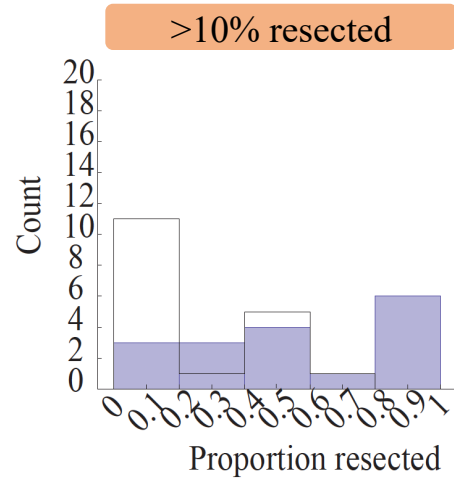


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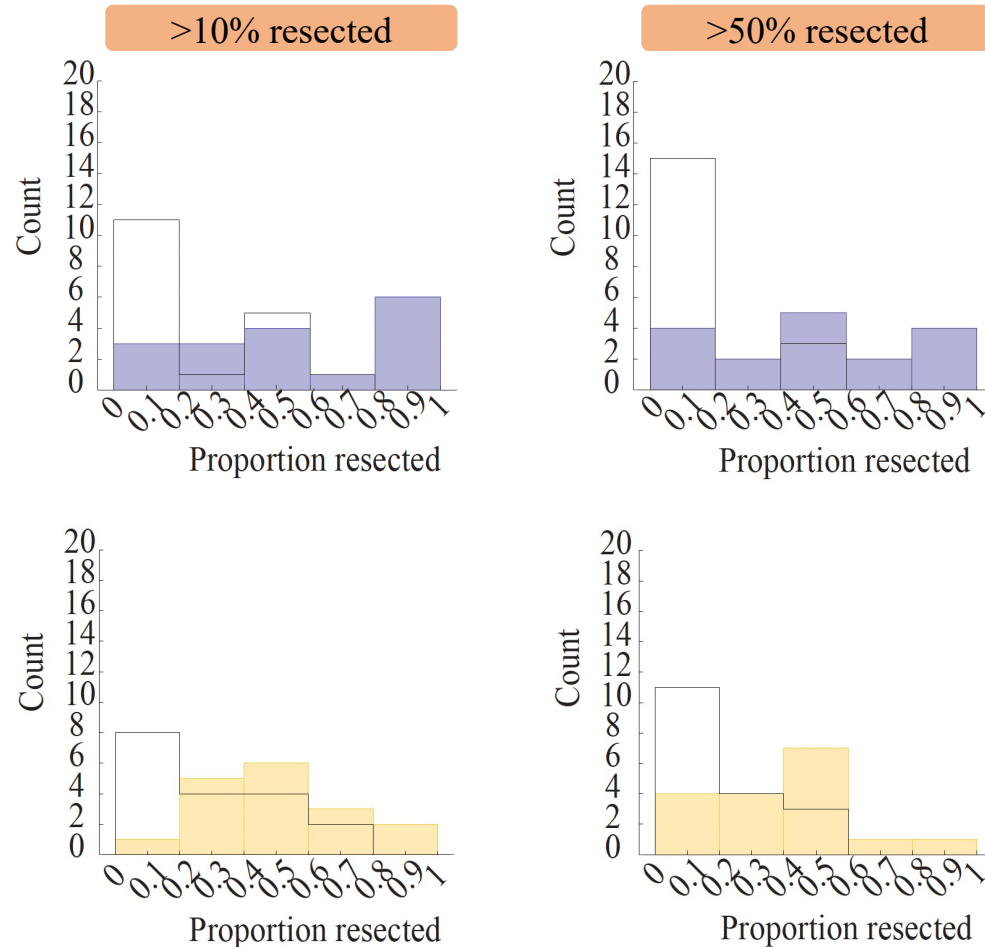


Aim 3: Does Resection of Foci differ between patient outcomes?

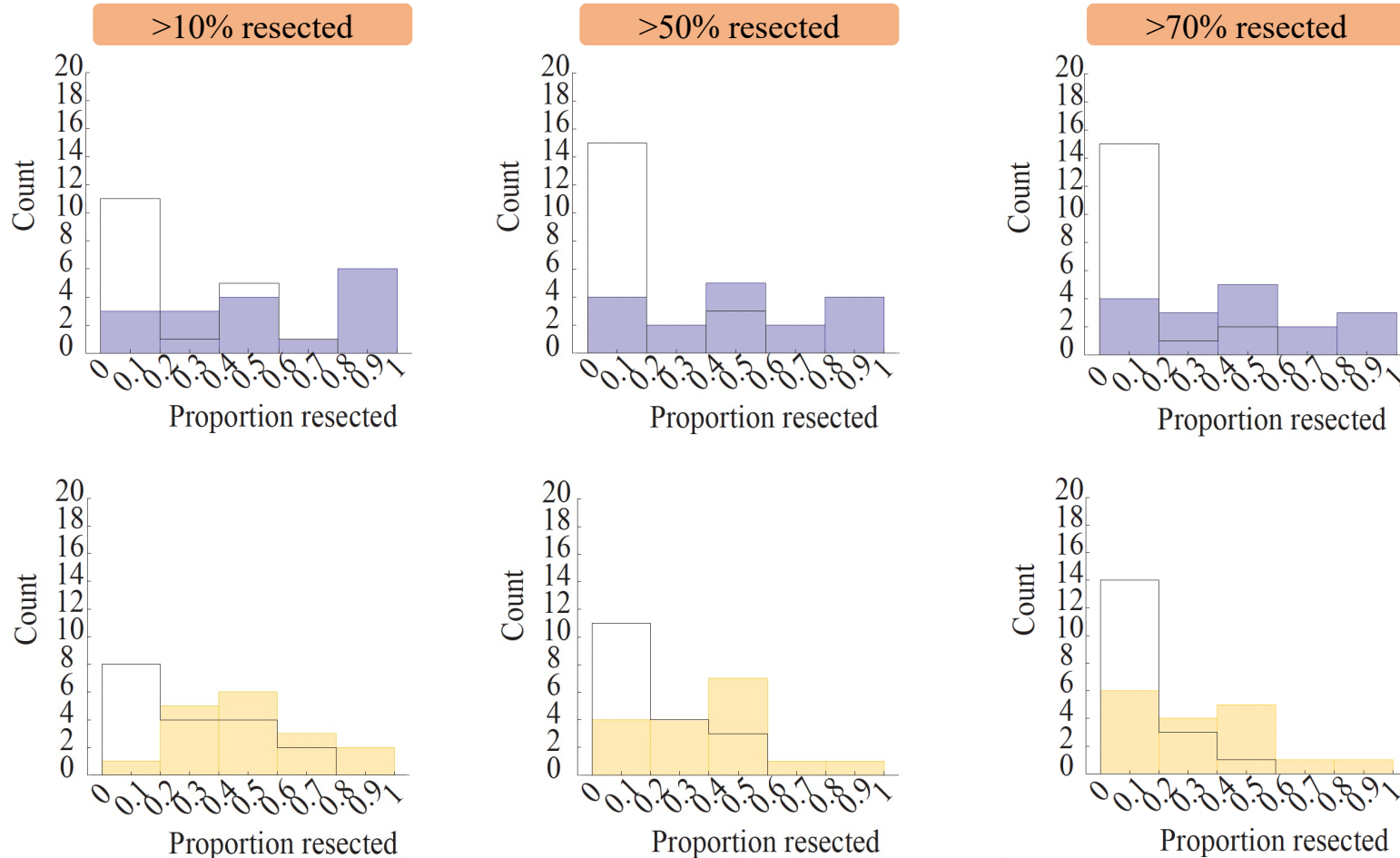
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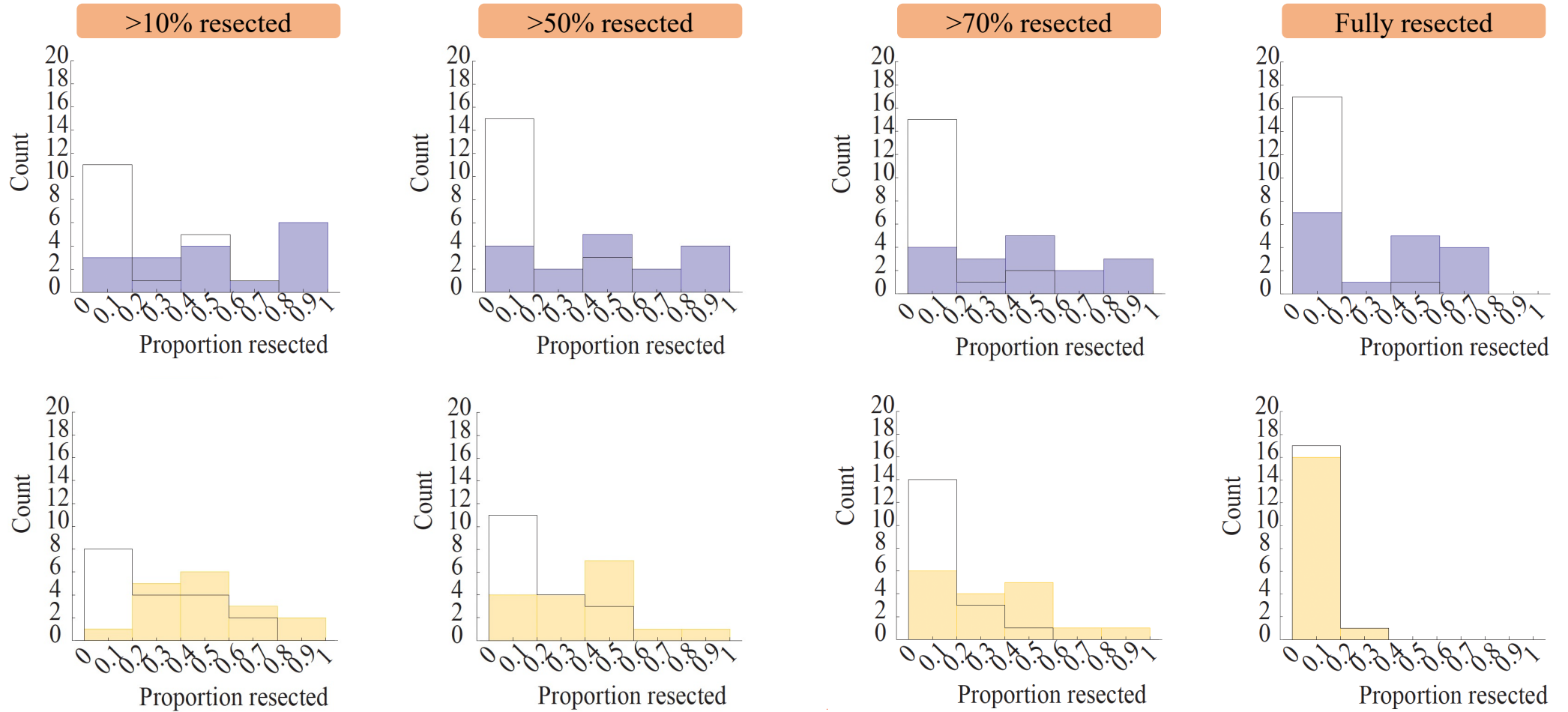
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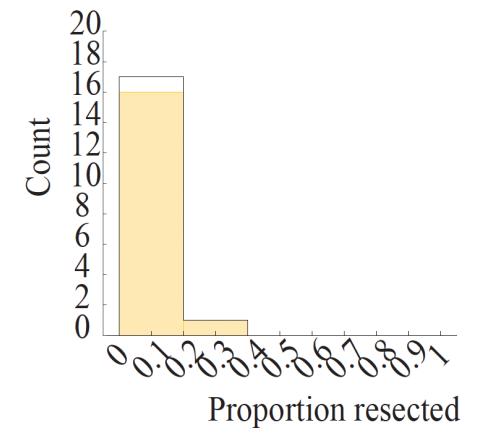
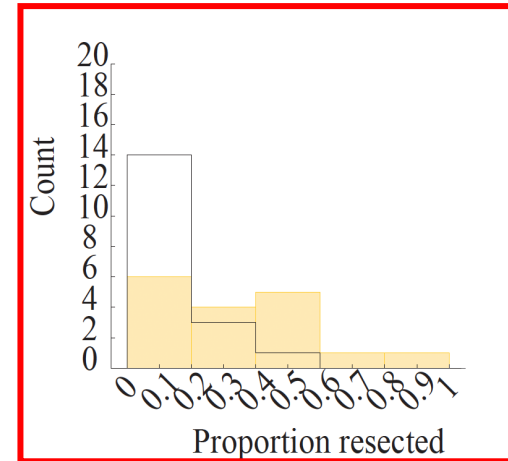
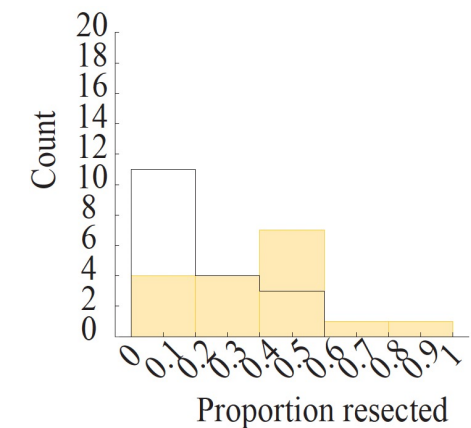
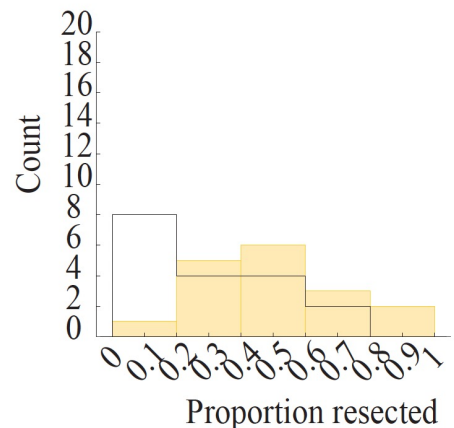
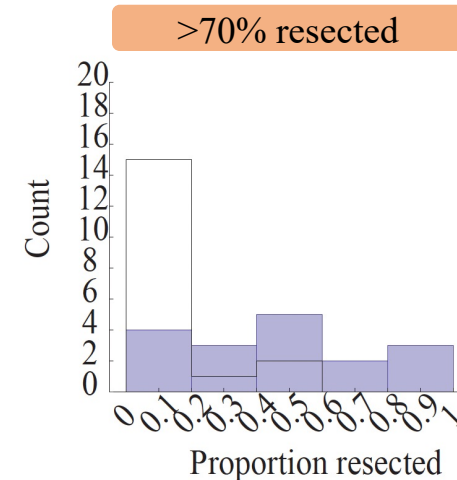
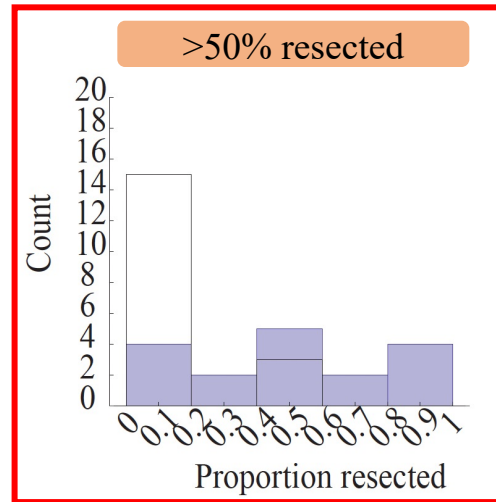
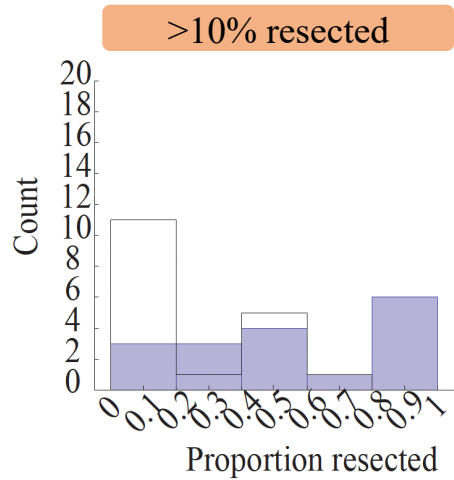
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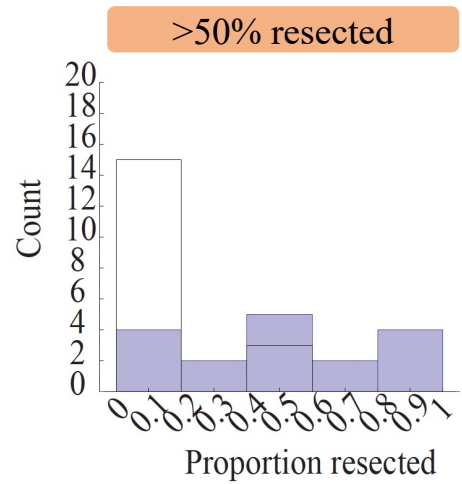
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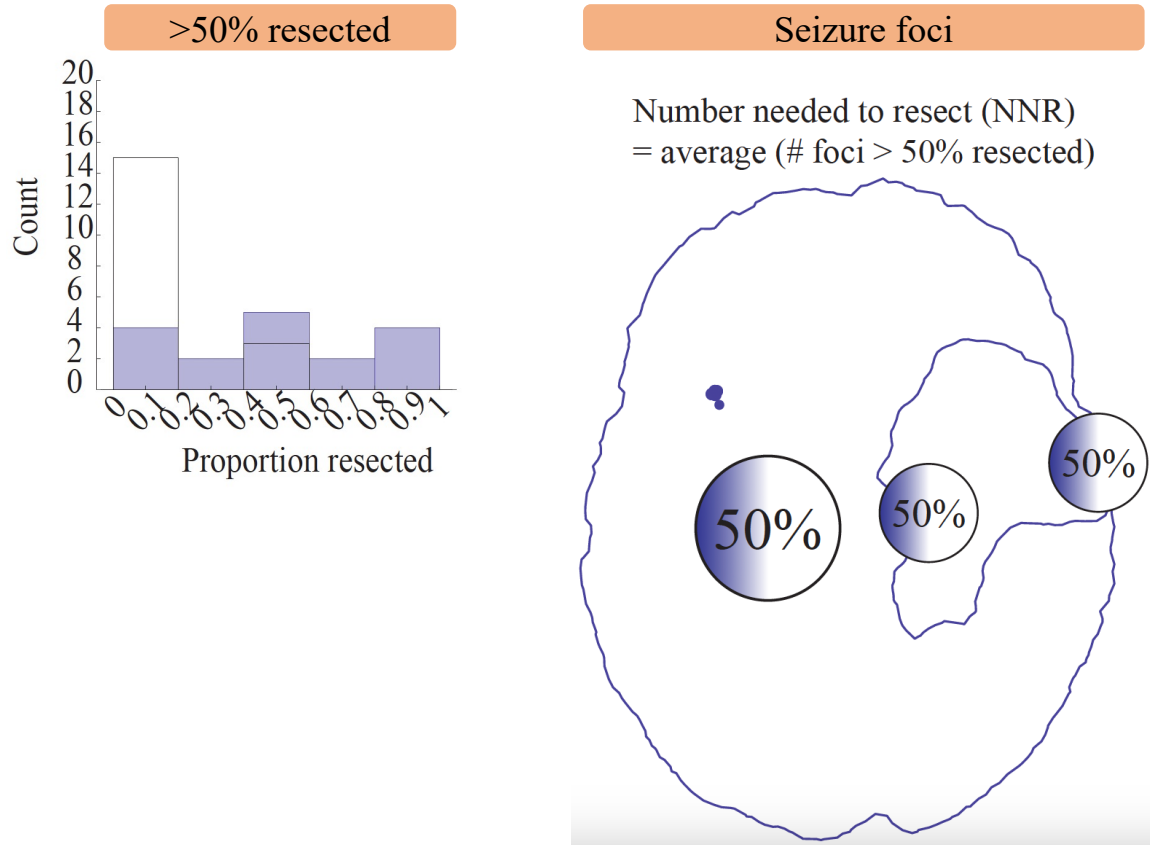
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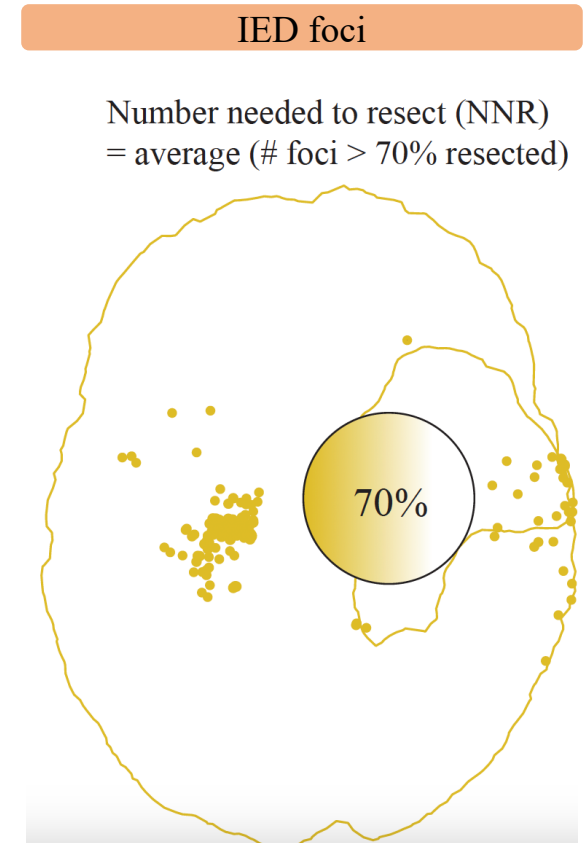
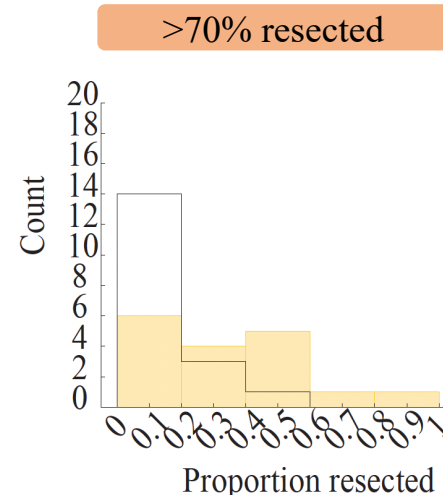
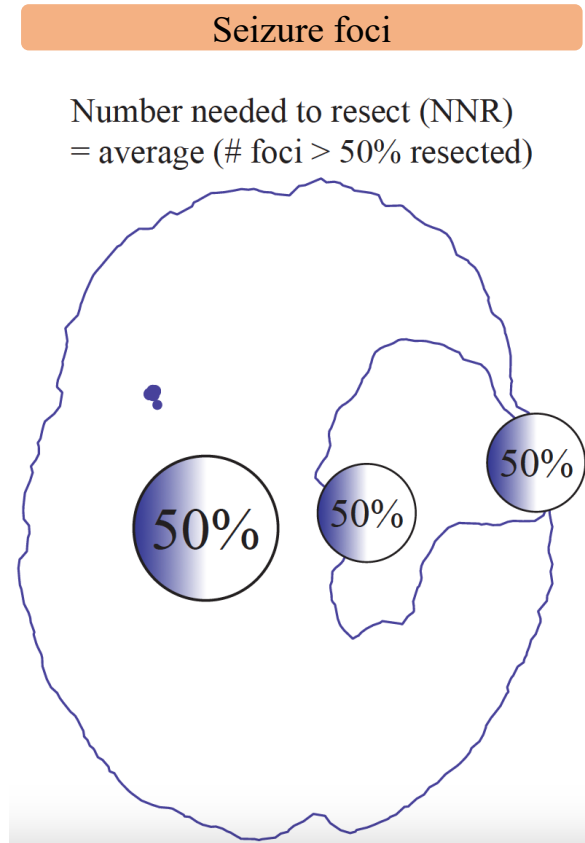
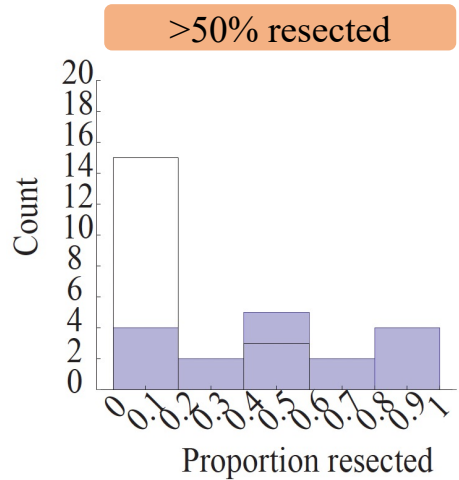
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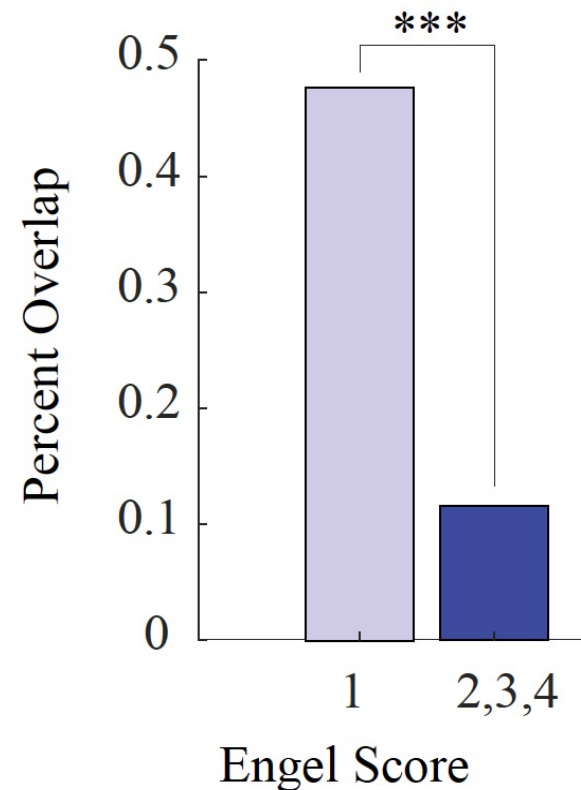
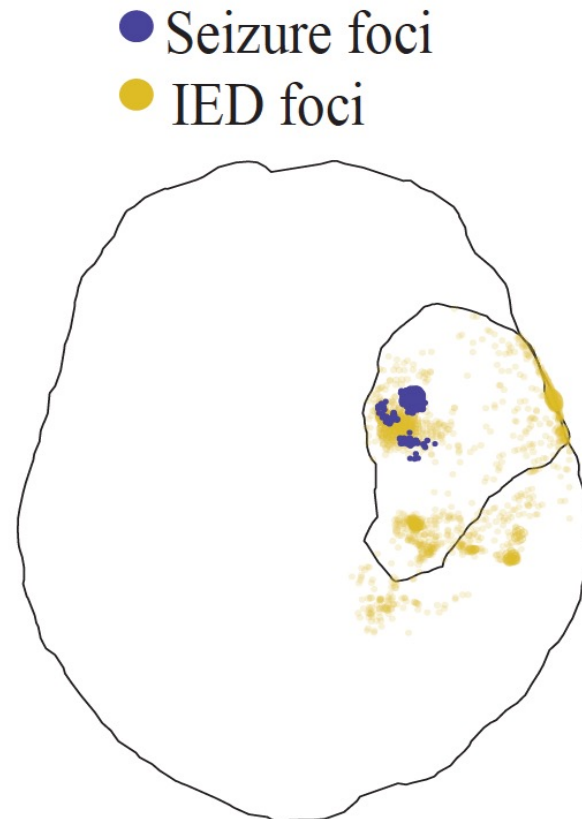
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Summary

- Source Localization of epileptic activity is crucial for improving outcomes
- IED and Seizure activity can both be described as traveling waves emanating from a focal source
- However focal sources can be dynamic and multifocal
 - Almost every subject revealed >1 foci
 - more likely in IED than seizure localizations
- IED foci are larger and sparser
- Engel Outcomes are most differed by a larger resection of 1 IED foci or smaller resection of multiple seizure foci
- This is further differentiated when resection includes the IED and seizure foci that overlap

Thank you