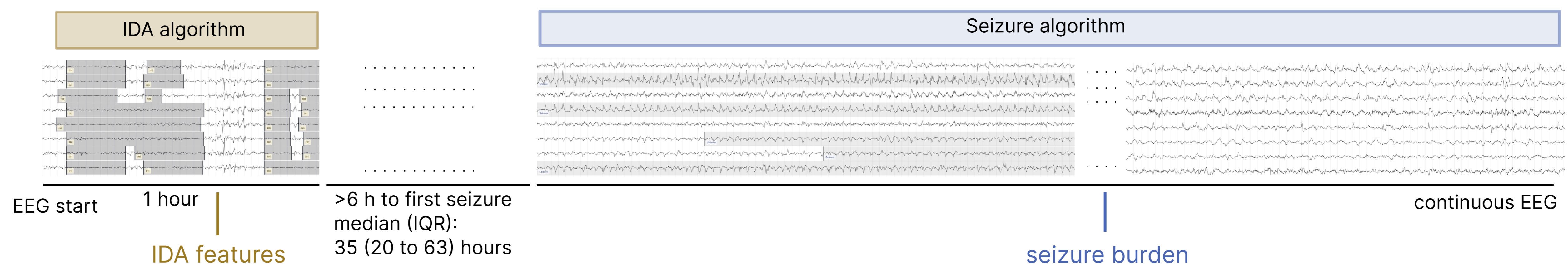


Background

- Early seizure detection enables timely intervention
- Seizure prediction can help optimize EEG monitoring for seizure surveillance

AIMS:

1. Use **AI to explore seizures and discontinuity** in a large neonatal EEG cohort.
2. Establish association between early features of **intervals of discontinuous activity (IDA)** and later seizures.



Methods

- Dataset: retrospective, anonymised EEG recorded at Cork University Maternity Hospital, Ireland (Table 1)
- Over **17,000 hours** of EEG from **435 term neonates**
- Previously developed state-of-the-art algorithms:
 - seizure detection (*Hogan et al., 2025*)
 - IDA detection
 - both achieve **expert-level equivalence**
- Calculate IDA features and test association with presence/absence of seizures and seizure burden.

Results

TABLE 1: Demographic and clinical characteristics for $n=435$ neonates. Data presented as median (IQR) or number (%).

Demographics		
Gestational age (weeks+days)	40+1	(39+0 to 40+6)
Birth weight (g) [$n=228$]	3505	(3178 to 3885)
Sex (female) [$n=434$]	179	41.2%
Therapeutic hypothermia [$n=178$]	63	35.4%
Primary Diagnosis		
HIE (grade: mild/moderate/severe)	189	89 / 77 / 23
Perinatal asphyxia	62	
Stroke	10	
Other	61	
Unknown	40	
Normal Cohort	73	
EEG Characteristics		
Total EEG duration (hours)	17,128	
EEG duration per neonate (hours)	23.9	(3.2 to 74.4)
EEG start (postnatal age, hours)	8.7	(4.0 to 15.9)

FIGURE 1: Quantitative features of intervals of discontinuous activity (IDA) separated by seizure group. (***) indicates $p < 0.001$

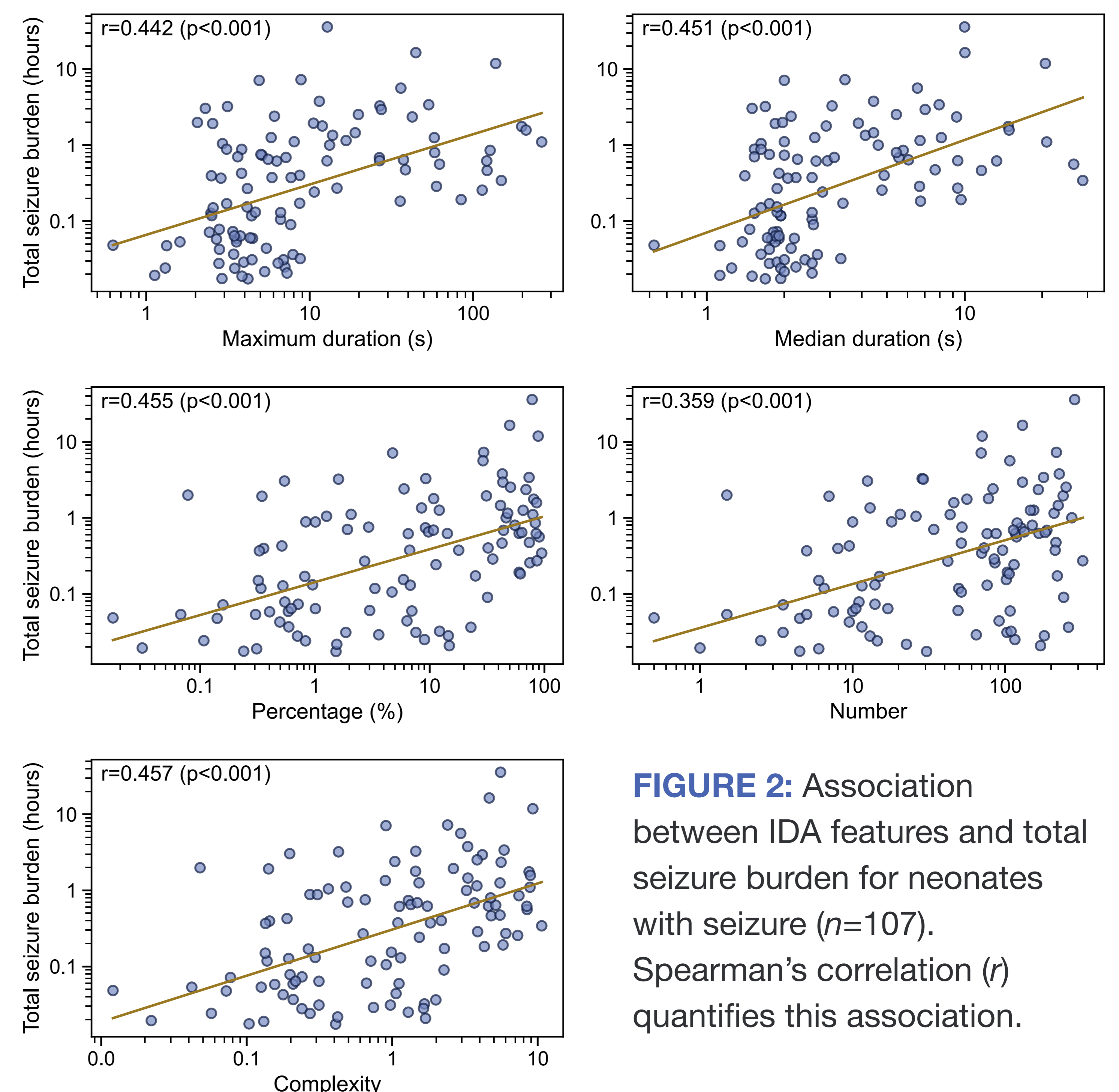
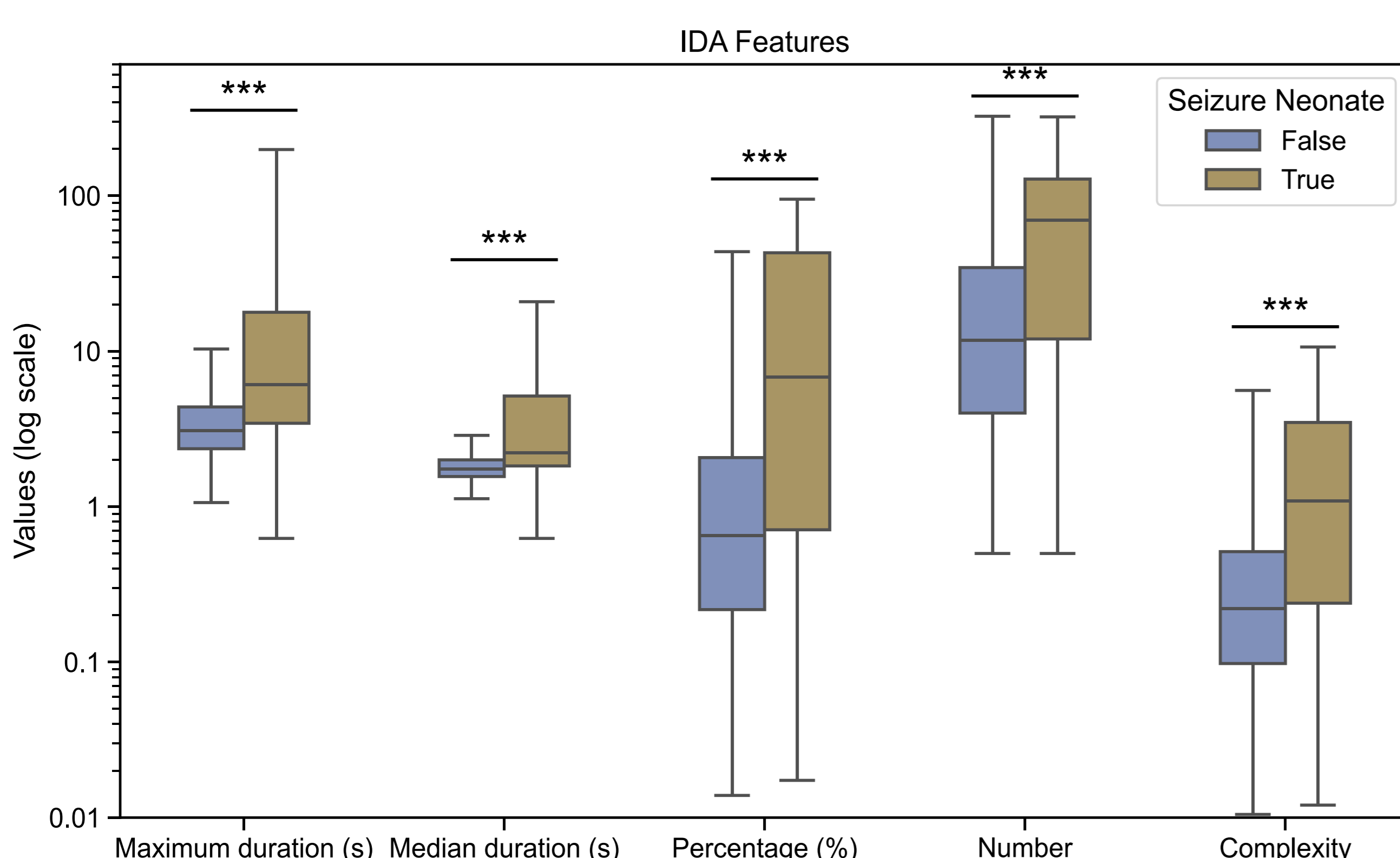


FIGURE 2: Association between IDA features and total seizure burden for neonates with seizure ($n=107$). Spearman's correlation (r) quantifies this association.

Conclusions

- AI methods enabled detailed annotation of a large EEG dataset at a scale beyond human capacity.
- Early quantitative measures of **discontinuity are significantly associated with seizures** and total seizure burden.
- Expert-level AI systems present a **promising new frontier** for neonatal EEG interpretation.

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References:

Hogan R et al. Scaling convolutional neural networks achieves expert-level seizure detection in neonatal EEG, *npj Digital Medicine* 8, 17 (2025)