# EPILEPTIC SEIZURE PREDICTION USING CONVOLUTIONAL NEURAL NETWORKS

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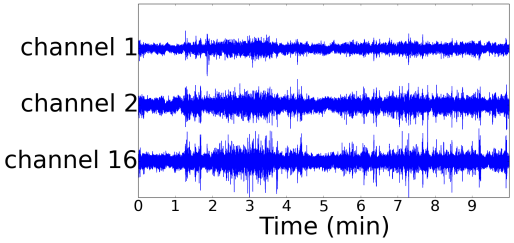
## Introduction

EEG-based seizure forecasting systems hold promise for improving the quality of life for ≈1% of the world's population suffering from epilepsy.

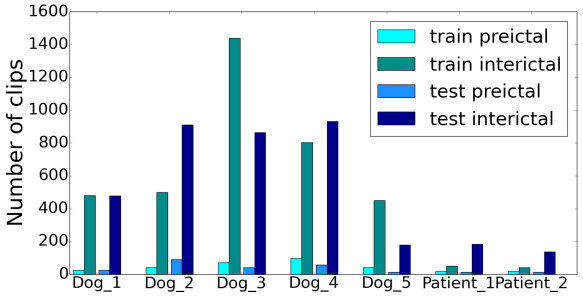
The primary problem in seizure prediction is differentiating between states of normal and pre-seizure EEG activity. In attempt to develop better classification algorithms *"American Epilepsy Society Seizure Prediction Challenge"* was organized on kaggle.com, where we placed 10th out of 504 teams.

## Problem




Preictal (prior to seizure) vs. Interictal (between seizures)

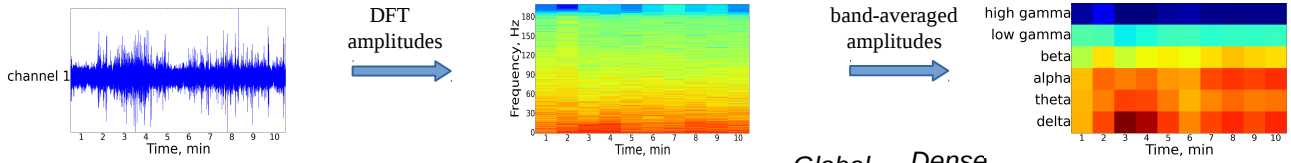
## Data



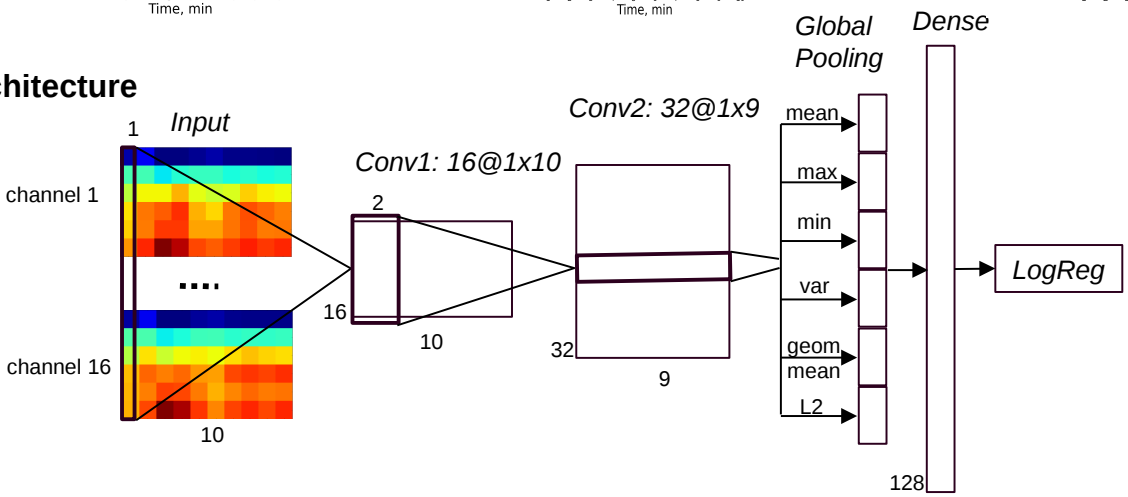

## Evaluation

ROC AUC over all subjects' preictal posteriors

## Data preprocessing




## Architecture




## Results

| Place | Team | Public LB | Private LB | Held-out |
|---|---|---|---|---|
| 1 | QMSDP | 0.85951 | **0.81962** | 0.75431 |
| 2 | Birchwood | 0.83869 | 0.80079 | 0.73665 |
| 3 | ESAI CEU-UCH | 0.82488 | 0.79347 | 0.63310 |
| 4 | Michael Hills | **0.86248** | 0.79251 | **0.79022** |
| 5 | KPZZ | 0.82051 | 0.79136 | - |
| 6 | Carlos Fernandez | 0.84225 | 0.79063 | - |
| 7 | Isaac | 0.84197 | 0.78863 | - |
| 8 | Wei Wu | 0.81803 | 0.78724 | 0.77259 |
| 9 | Golondrina | 0.82455 | 0.78513 | 0.76338 |

## Conclusions

The classifier based on convolutional neural networks requires simple frequency features to achieve high performance as compared to methods, which heavily exploit feature engineering.

The discrepancy between AUC scores on different test sets (private and held-out) demonstrates the necessity of other testing and training strategies for EEG classification.

Moreover, AUC is not the most relevant metric for an alarm system evaluation, since it ignores the problem of choosing a classification threshold.

Overall, this study is incomplete. More in-depth analysis of the proposed solutions is required.