**Summer 2024 USRA(URA) Report**

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**Technique 1: Naive classification**

**Technique 3: Destructive Patching**

**Technique 4: Early Concatenation**

**Technique 5: Bidirectional Cross Attention**

**STAGE 1 Results**

*Original findings without TP, TN, FP, FN*

| **Original** | **VIT** | | **ResNet 50** | |
| --- | --- | --- | --- | --- |
| Method | Balanced Accuracy | Macro F1 | Balanced Accuracy | Macro F1 |
| Technique 1 | 62.1% | 0.361 | 65.1% | 0.362 |
| Technique 3 | 65.3% | 0.465 | 67.5% | 0.463 |
| Technique 4 | 64.3% | 0.48 |  |  |
| Technique 5 | 50% |  |  |  |

*Ours findings with TP, TN, FP, FN*

| **Ours** | **VIT** | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Method | Balanced Accuracy | Macro F1 | TP | TN | FP | FN |
| Technique 1 | 62.12% | 0.417 | 3276 | 2053 | 54 | 91 |
| Technique 2 | Error – running with GCP results to runtime error of not enough resources and program crashes | | | | | |
| Technique 3 | 64.64% | 0.47 | 3949 | 1380 | 65 | 80 |
| Technique 4 |  |  |  |  |  |  |
| Technique 5 | 64.23% | 0.67936 |  |  |  |  |

| **Ours** | **ResNet 50** | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Method | Balanced Accuracy | Macro F1 | TP | TN | FP | FN |
| Technique 1 | 59.68% | 0.428 | 3421 | 1908 | 65 | 80 |
| Technique 2 | 61.23% | 0.504 | 4468 | 861 | 89 | 56 |
| Technique 3 | 58.481% | 0.472 | 3951 | 1378 | 65 | 80 |
| Technique 4 | 63.82% | 0.660968 |  |  |  |  |
| Technique 5 | 50% | 0.51313 |  |  |  |  |

**STAGE 2 RESULTS**

Some of the Balanced Accuracy differ than the original results (less than 1%)

**Technique 1/ Naive classification ResNet 50**

| Aggregate  Type | Best  Classifier | Balanced  Accuracy | Macro  F1 | TP | TN | FP | FN |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Average  Probability  Feature | mlp | 67.45% | 0.4052 | 44 | 1343 | 984 | 13 |
| Max  Probability  Feature | random\_forest | 67.71% | 0.4001 | 20 | 1990 | 337 | 37 |
| Min  Probability  Feature | mlp | 65.96% | 0.4132 | 36 | 1435 | 892 | 21 |
| Average,  Min, Max  Probability  Feature | random\_forest | 58.88% | 0.449 | 2 | 2297 | 30 | 55 |
| Padded  Probability  Features | random\_forest(all same ) | 50% | 0.494 | 0 | 2327 | 0 | 57 |

**Technique 1/ Naive classification VIT**

| Aggregate  Type | Best  Classifier | Balanced  Accuracy | Macro  F1 | TP | TN | FP | FN |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Average  Probability  Feature | random\_forest | 66.52% | 0.3805 | 20 | 2053 | 274 | 37 |
| Max  Probability  Feature | random\_forest | 65.27% | 0.3991 | 19 | 1984 | 343 | 38 |
| Min  Probability  Feature | random\_forest | 66.48% | 0.4182 | 12 | 2099 | 228 | 45 |
| Average,  Min, Max  Probability  Feature | random\_forest | 64.79% | 0.4358 | 2 | 2265 | 62 | 55 |
| Padded  Probability  Features | svm | 50.4% | 0.5042 | 1 | 2305 | 22 | 56 |

**Technique 3/ Destructive Patching ResNet 50**

| Aggregate  Type | Best  Classifier | Balanced  Accuracy | Macro  F1 | TP | TN | FP | FN |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Average  Probability  Feature | random\_forest | 69.06% | 0.4576 | 15 | 2053 | 274 | 42 |
| Max  Probability  Feature | random\_forest | 67.02% | 0.3854 | 17 | 1944 | 383 | 40 |
| Min  Probability  Feature | random\_forest | 70.05% | 0.4599 | 11 | 2166 | 161 | 46 |
| Average,  Min, Max  Probability  Feature | random\_forest | 67.5% | 0.4207 | 5 | 2262 | 65 | 52 |
| Padded  Probability  Features | knn | 50.88% | 0.5113 | 0 | 2327 | 0 | 57 |

The best performing technique: ResNet50 with Destructive Patching and Minimum Probability

**Technique 3/ Destructive Patching VIT**

| Aggregate  Type | Best  Classifier | Balanced  Accuracy | Macro  F1 | TP | TN | FP | FN |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Average  Probability  Feature | random\_forest | 62.96% | 0.435 | 6 | 2291 | 36 | 51 |
| Max  Probability  Feature | random\_forest | 65.33% | 0.4713 | 13 | 2125 | 202 | 44 |
| Min  Probability  Feature | random\_forest | 64.4% | 0.4624 | 8 | 2162 | 165 | 49 |
| Average,  Min, Max  Probability  Feature | random\_forest | 61.76% | 0.4647 | 3 | 2297 | 30 | 54 |
| Padded  Probability  Features | svm | 50.51% | 0.5056 | 1 | 2310 | 17 | 56 |

**Technique 4/ Early Concatenation ResNet 50**

| Aggregate  Type | Best  Classifier | Balanced  Accuracy | Macro  F1 | TP | TN | FP | FN |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Average  Probability  Feature | random\_forest | 66.3% | 0.4882 | 3 | 2308 | 19 | 54 |
| Max  Probability  Feature | mlp | 69.65% | 0.4781 | 37 | 1645 | 682 | 20 |
| Min  Probability  Feature | random\_forest | 65.04% | 0.4191 | 8 | 2157 | 170 | 49 |
| Average,  Min, Max  Probability  Feature | random\_forest | 62.25% | 0.3924 | 0 | 2309 | 18 | 57 |
| Padded  Probability  Features | ada\_boost | 50.88% | 0.5113 | 0 | 2327 | 0 | 57 |

**Technique 4/ Early Concatenation VIT**

| Aggregate  Type | Best  Classifier | Balanced  Accuracy | Macro  F1 | TP | TN | FP | FN |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Average  Probability  Feature | random\_forest | 64.2% | 0.4886 | 0 | 2322 | 5 | 57 |
| Max  Probability  Feature | random\_forest | 65.43% | 0.4653 | 10 | 2093 | 234 | 47 |
| Min  Probability  Feature | random\_forest | 64.62% | 0.4644 | 13 | 2141 | 186 | 44 |
| Average,  Min, Max  Probability  Feature | random\_forest | 57.26% | 0.5231 | 0 | 2327 | 0 | 57 |
| Padded  Probability  Features | random\_forest (all same) | 50% | 0.494 | 0 | 2327 | 0 | 57 |

**Technique 5/ Bidirectional Cross Attention VIT & ResNet 50**

Don’t know how to do this for technique 5

“In order to speed up training on the predictions made by various techniques, they were cached and turned into a new binary classification dataset, this was done using the generate\_predicted\_datasets.py, which accepts the names of the top performing models across each technique and will produce new datasets in the data\_splits/ folder.”