Multimedia Satellite Task

# Deep Learning models for passability detection of flooded roads

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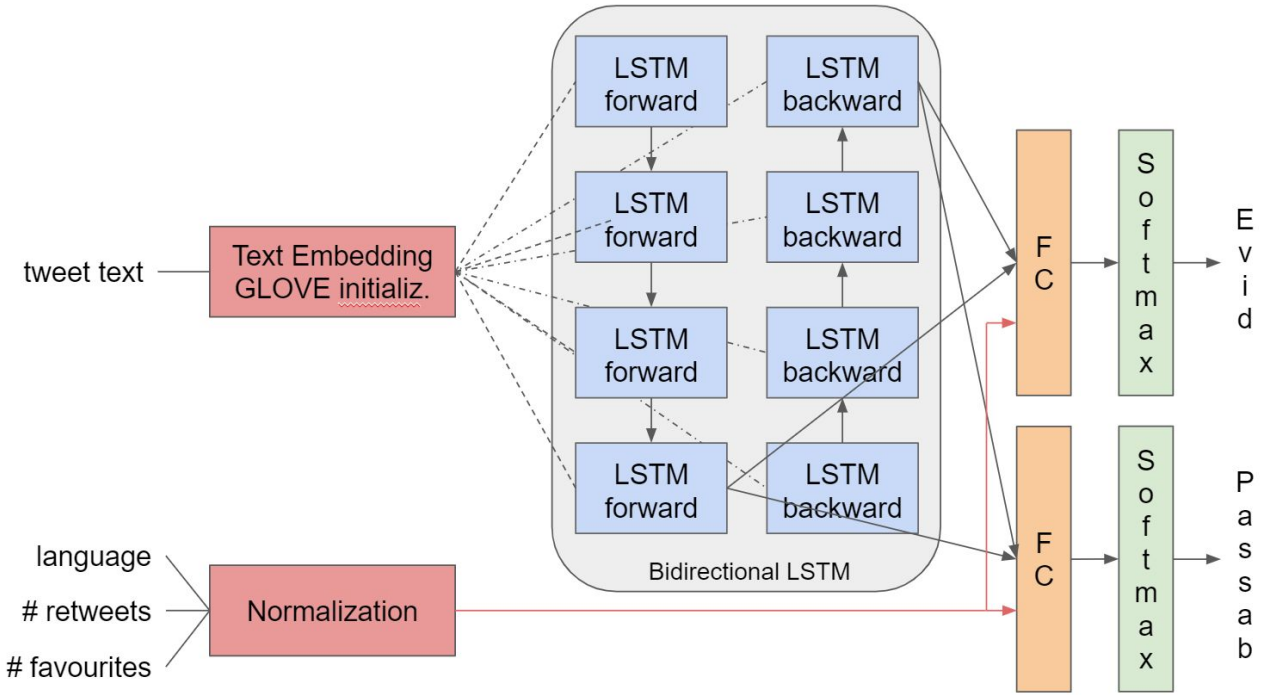
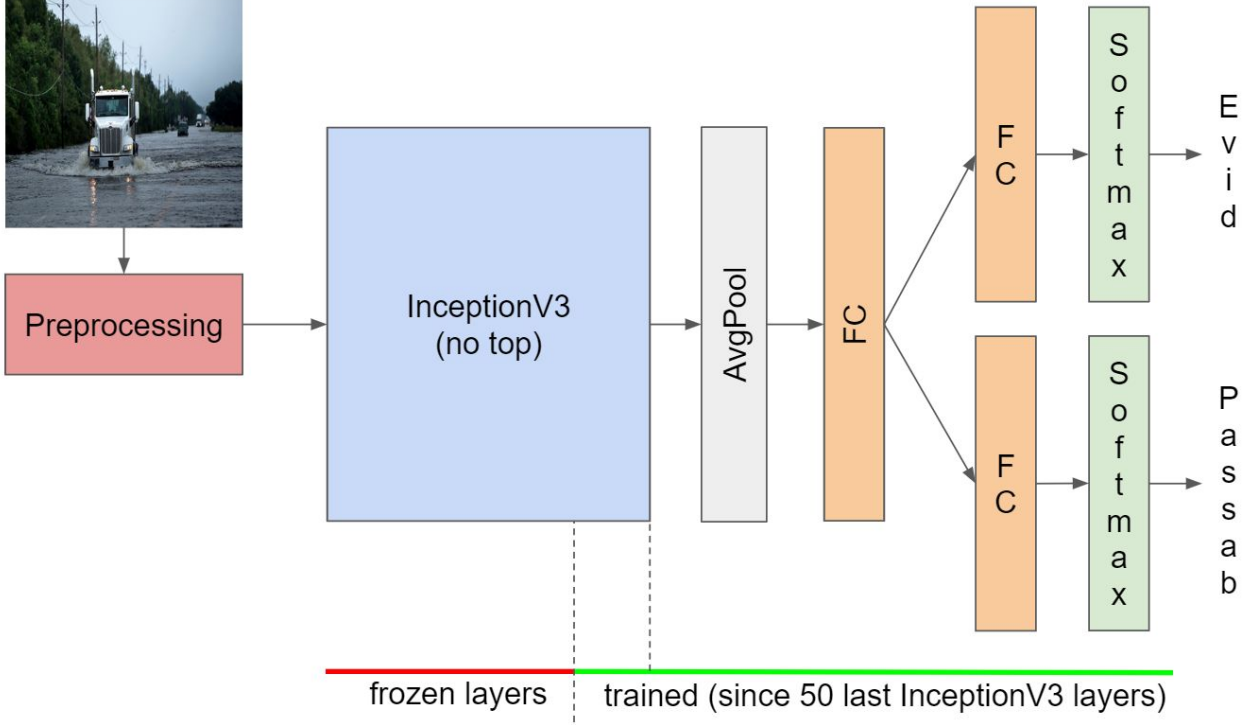
# Metadata-only Approach [MA]



# Image only - Double-Ended Classifier with Compact Loss [VA1]






**Custom optimization function:**

$$\hat{g} = \max_g \mathcal{D}(g(t)) + \lambda C(g(t))$$

$\mathcal{D}(g(t))$: descriptive loss

$C(g(t))$: compact loss

# Image only - Network Stacking [VA2, VA3]

Preprocessing

InceptionV3

Xception

VGG16

VGG19

InceptionResNetV2

MobileNet

DenseNet121

DenseNet201

NASNetLarge

P(evidence)

P(passability)

aggregation methodology

Evid

Passab

**Aggregation Methodologies:**

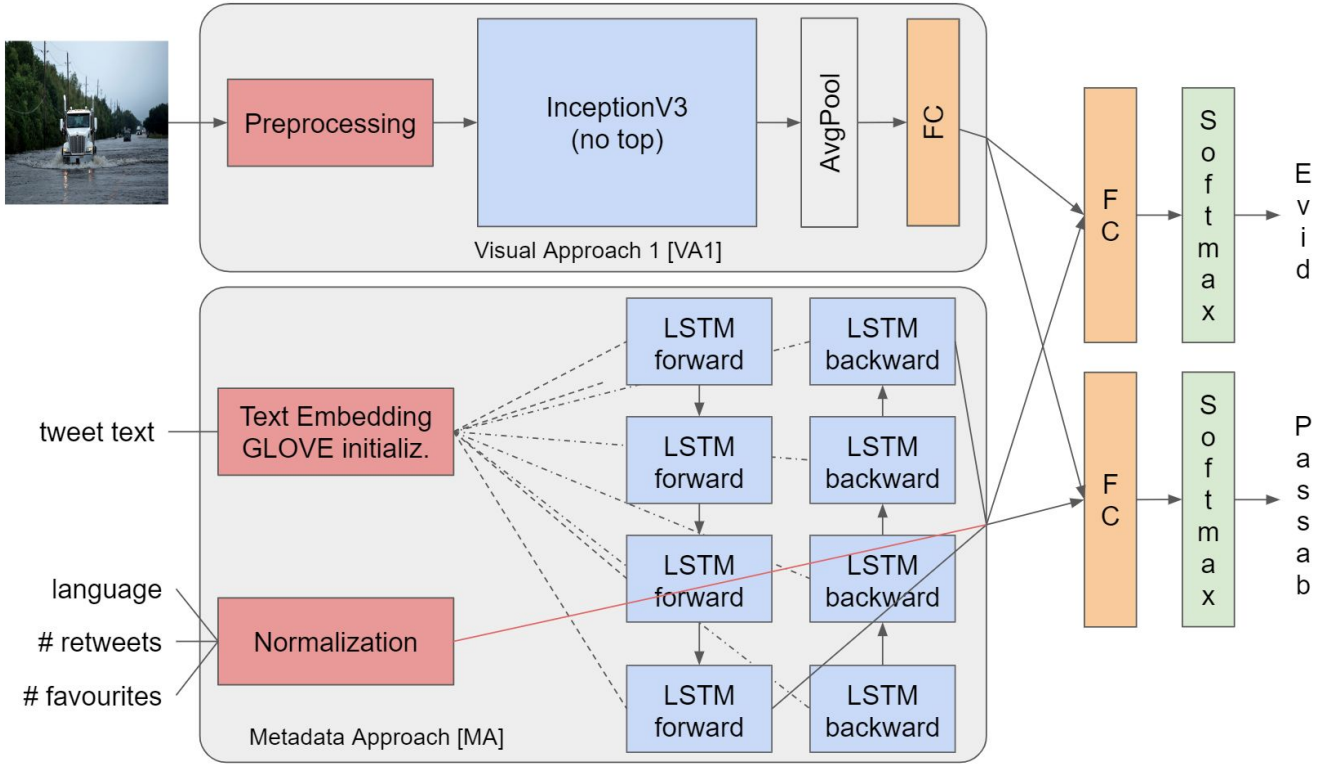
- Average aggregation [VA2]:

$$pred(p_1, ..., p_n) = (\overline{p} > 0.5)$$

- Average and voting aggregation [VA3]:

$$pred(p_1, ..., p_n) = \begin{cases} 1 & \text{if } \left(\overline{p} > 0.5 \text{ and } voting(p_1, ..., p_n) > \frac{n}{2} - 2\right) \\ & \text{or } \left(\overline{p} > 0.45 \text{ and } voting(p_1, ..., p_n) \geq \frac{n}{2}\right), \\ 0 & \text{otherwise.} \end{cases}$$

# Metadata and Image Approach [MA+VA1]



# Results

| Approach \Data | EVIDENCE [%] | | | | PASSABILITY [%] | | | |
|---|---|---|---|---|---|---|---|---|
| | Metadata | Images | | Meta + Imgs | Metadata | Images | | Meta + Imgs |
| Human annotation | 51.48 | 87.32 | | - | 18.18 | 47.71 | | - |
| Metadata only [MA] | 43.88 | - | | - | 19.3 | - | | - |
| Image only [VA1, VA2, VA3] | - | 85.6 | 86.43 | 87.79 | - | 24.09 | 67.13 | 68.38 | - |
| Metadata and Image [VA1+MA] | - | - | | 83.12 | - | - | | 28.34 |

- Manual annotation experiment shows that the dataset suffers from ambiguity in its annotation
- Metadata was not very discriminative for this task
- Visual Applications work quite well on the Evidence sub-task
- In Passability sub-task, training directly on the task significantly improves the results.
- Combining Metadata and Images worsen the results (compared to using only Images)

# Thanks for your attention!

## Any questions?

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