**SANDI: Story-and-Images Alignment**

**Problem Statement**
Given a story and a set of images, the goal is to select relevant images and place selected images within semantically meaningful paragraphs.

**Model Formulation**
Objective: Maximize semantic relatedness of text-image pairs.

\[
\max \left[ \sum_{i \in I} \sum_{t \in T} \text{rel}(i, t)X_{it} \right]
\]

- \(X_{it} = 1\) if image \(i\) is selected for paragraph \(t\), 0 otherwise
- ILP Constraints:
  - \(\sum_{i} X_{it} \leq 1\) \(\forall t\) only one image aligned to a paragraph
  - \(\sum_{t} X_{it} \leq 1\) \(\forall i\) an image appears only once in the story; not all images need to be placed
  - \(\sum_{i} \sum_{t} X_{it} = b\) \(b\) images should be selected and placed within the story

We evaluate two flavors of SANDI:
- Complete Alignment (placement of all images in a story)
- Selective Alignment (selection and placement of a fixed number of images in a story)

**Image Tags**
CV: detected objects/scenes (from Computer Vision tools)
MAN: user tags (often MANually assigned)
BD: tags from reverse image web search leveraging the power of Big Data
CSK: high-level thematic concepts from CommonSense Knowledge base Conceptnet

**Results**
Quantitative evaluations show that SANDI’s image selections and placements are closer to the ground truths than those of the baselines.

<table>
<thead>
<tr>
<th>Image and detected concepts</th>
<th>SANDI-CV</th>
<th>SANDI-MAN</th>
<th>SANDI-BD</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand produced the first man to ever climb Mount Everest and also the creator of the bungee-jump. Thus, it comes as no surprise that this country is filled with adventures and adrenaline junkies.</td>
<td>CV: snowy mountains, massif, alpine glacier, mountain range MAN: outdoor lover, New Zealand, study destination, BD: New Zealand</td>
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<tr>
<td>Moreover, the wildlife in New Zealand is something to behold. Try and find a Kiwi! (The bird!) They are nocturnal creatures so it is quite a challenge. New Zealand is also home to the smallest dolphin species. Lastly, take the opportunity to search for the beautiful yellow-eyed penguin.</td>
<td>CV: umbrella, beach MAN: white sands BD: Playa Ancon Cuba CSK: sandy shore, vacation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig: Example alignments. Highlighted texts show similar concepts between image and aligned paragraphs.

**References**: