All members to each team must present together as a team, with each member having a fare share of speaking about certain part of the project  
Presentations should be somewhat high level, and must be done with proper slides (no jupyter notebook or python script)  
The introductory speaker of each team should spend some time in the beginning to very briefly introduce the members  
The following point should eventually be included in the presentation:  
      a. Definition of business problem  
      b. Motivation/ what is it good for?  
      c. Data source/ data collection / challenges  
      d. Methodology and technology stacks used  
      e. modelling  
      f. demonstration of the model, ideally with an app  
      h. future goals and open questions

**Slide 10: Dataset and Training Approach**

* **Initial Dataset:** Started with 100 individuals for each severity category.
* **Challenges:** Poor predictions after initial training.
* **Improved Approach:** Increased dataset to 400 individuals per category, keeping weight equal across all severity categories, with oversampling on a personal level (more images per person).

 **Average Images per Person:**  
Each individual in this group has, on average, **60 images**, totaling **60,000 rows**.

 **Random Sampling Strategy:**

* A **random sample of 6,000 images** is selected for each severity category.
* The sample is **balanced by severity** but **undersampled by person**, meaning that individuals with more severe conditions are represented proportionally fewer times.

**Slide 11: Predictions and Observations**

* **Confusion Matrix:** To be provided later.
* **Model Performance:**
  + The first and last classes were poorly predicted.
  + The severe class was misclassified as moderate by 69%, reflecting the continuum of conditions.
* **Classification Adjustments:** Combined moderate and severe categories into a single "damage or not damage" category to improve model focus.

**Slide 6: Evaluation Metric**

* **Metric Used**: Weighted log loss and an additional metric called any\_severe\_spinal.
* **Weights by Severity Level**:
  + Normal/Mild: Weight = 1
  + Moderate: Weight = 2
  + Severe: Weight = 4
* **Submission Format**: Probability predictions for each severity level.

**Slide 7: Submission Format Example**

* **File Format**:  
  Example row: row\_id, normal\_mild, moderate, severe  
  e.g., 123456\_left\_neural\_foraminal\_narrowing\_l1\_l2, 0.333, 0.333, 0.333
* **Nulls in Rows**: Nulls are not allowed; predictions are required even for non-visible vertebrae.

**Slide 8: Model Development Strategy**

* **Model Objective**: Predict severity of spine degeneration conditions.
* **Techniques Considered**: Transfer learning with models like ResNet-50, CNN-based architectures, ensemble methods.
* **Data Augmentation and Preprocessing**: Techniques to increase model generalizability.

**Slide 9: Project Overview (Previously Slide 1)**

* **Goal**: Classify spinal conditions using MRI images.
* **Focus**: Left Neural Foraminal Narrowing and L5/S1 location for computational efficiency.
* **Method**: Leveraging Sagittal images to identify stenosis and neural foraminal narrowing.

**Slide 10: Image Categories (Previously Slide 2)**

* **Sagittal T2/STIR**
* **Sagittal T1**
* **Axial T2**

**Slide 11: Image Quality Assessment (Previously Slide 3)**

* **Key Insight**: Different image types have varying effectiveness for detecting damage.
  + **All images should be used**, but some images contribute more significantly than others.
* **Focus**: Sagittal images, as they provide a complete view of the spine, critical for condition identification.

**Slide 12: Condition Assessment (Previously Slide 4)**

* **Spinal Canal Stenosis**: Primarily assessed with **Sagittal T2/STIR**, **Sagittal T1**, and **Axial T2**.
* **Subarticular Stenosis (Left/Right)**: Best visualized with **Axial T2** and **Sagittal T2**.
* **Neural Foraminal Narrowing (Left/Right)**: Best seen with **Sagittal T2/STIR**, **Sagittal T1**, and sometimes **Axial T2**.

**Slide 13: Image Selection Rationale (Previously Slide 5)**

* **Sagittal Images**:
  + Show the entire spine, providing more context for detecting stenosis and neural foraminal narrowing.
* **Axial Images**:
  + Only show localized parts of the spine, limiting their effectiveness for detecting stenosis when only one image per person is available.
  + Risk of selecting an incorrect position if Axial images are used.

**Slide 14: Dataset and Methodology (Previously Slide 6)**

* **Dataset**: Curated from 8 global sites, spanning 5 continents.
* **Grading by Disc Levels**: Severity scores across L1/L2 to L5/S1 disc levels.
* **Goal**: Develop a standardized classification for more accurate and rapid diagnosis.

**Slide 1: Preliminary Results**

* Predictions with 100 individuals per severity classification range between **35%** and **37%** accuracy.
* Changing layers in the model did not improve the results.

**Slide 2: New Sample Strategy**

* Cases with **medium** and **severe** severity are **undersampled** in terms of persons, but **balanced** in terms of images.
* For each person, there are **4000 images**.

**Slide 3: Training Details**

* Train-test split is set at **80%** for training and **20%** for testing.
* Calculation time on the training set is approximately **4 hours**.

**Slide 4: Early Stopping**

* **Early stopping** was applied after **6 epochs** due to divergence between the **validation** and **training datasets**.

**Slide 1: Prediction Challenges for the First Category**

* **First Category Prediction Issue**: The **first category** (Normal/Mild) is predicted very poorly.
* **Misclassification**: Frequently predicted as the **second category** (Moderate).
* **Spinal Damage Issue**: There is **no clear distinction** between medium and severe severity.
* **Subjectivity in Diagnosis**: Doctors often decide how to classify conditions, leading to variations in interpretation.

**Slide 2: Combining Medium and Severe Categories**

* **Decision**: Due to the lack of clear distinction, the **Medium** and **Severe** categories have been combined into a **single "Damage or Not Damage" classification**.
* **Rationale**:
  + Some spinal conditions involve prolapse or protrusion, while others do not.
  + By combining these categories, a more practical and consistent classification approach is adopted.

 The **training data** contains images labeled with **damage severity** (e.g., mild, moderate, severe).

*  However, the **decision of how much damage qualifies** as "big" or "small" is **not standardized**.