Assignment: RGB to Depth Conversion and Child Height Estimation

Objective: Your task is to develop a solution that converts RGB images to depth maps using state-of-the-art deep learning methods. The converted depth maps will then be compared with the provided depth maps obtained from Time-of-Flight (ToF) sensors. Additionally, you need to estimate the height of children using both the converted depth maps and the given depth maps.

Instructions:

1. RGB to Depth Conversion:
    - Implement a deep learning-based method to convert the provided RGB images into depth maps.
    - Use state-of-the-art architectures and techniques for accurate and reliable depth estimation.
    - Train and fine-tune the model if necessary using an appropriate dataset or pre-trained weights.
2. Depth Map Comparison:
    - Compare the converted depth maps with the given depth maps obtained from ToF sensors.
    - Utilize suitable metrics to evaluate the similarity or dissimilarity between the depth maps.
    - Document the comparison metrics used and explain their relevance in assessing the accuracy of the conversion process.

Bonus:

3. Child Height Estimation:
    - Utilize the converted depth maps and the given depth maps to estimate the height of children.
    - Identify the region or object in each depth map that corresponds to the child.
    - Extract the height information and calculate the height for each child present in both the converted and given depth maps.
4. Height Comparison and Analysis:
    - Calculate the height differences between the child's height estimated from the converted depth maps and the given depth maps.
    - Analyze the accuracy and precision of the estimated heights.

- Document any observations or insights regarding the height estimation process.

Deliverables:

1. Code: Implement the solution in a programming language of your choice, utilizing deep learning frameworks and suitable libraries for image processing and comparison.
2. Documentation: Provide clear documentation on the implemented method, including details about the deep learning architecture used, training process (if applicable), and depth map comparison metrics employed.
3. Results: Present the comparison metrics for the depth map conversion, along with the height estimates for the children derived from the converted and given depth maps.

Note:

- Ensure that the deep learning method used for RGB to depth conversion is state-of-the-art and capable of producing accurate depth maps.
- Utilize appropriate evaluation metrics for depth map comparison, such as mean squared error (MSE), structural similarity index (SSIM), or others based on the characteristics of the depth maps.
- Pay attention to the accuracy and precision of the child height estimation process, considering the reliability of the depth maps obtained.
- You can use pre-trained models or datasets for training the depth estimation model if required.
- Test your solution on a representative dataset to validate its effectiveness and accuracy.

Submission: Submit your solution as a zip file containing the code, documentation, and results. Include any instructions required to run the code and reproduce the results.

Evaluation Criteria:

- Accuracy and reliability of the RGB to depth conversion.
- Accuracy and suitability of the depth map comparison metrics.
- Accuracy and precision of the child height estimation process.
- Code quality, efficiency, and organization.
- Clarity and completeness of the documentation.

Good luck!