**MEDICAL ETHICS FOR THE PROPOSAL**

Medical ethics has a closed relationship with law. Ethical principles such as respect for the persons, informed consent and confidentiality are basic to the patient-physician relationship.

* **Autonomy**

Patient has freedom of thought, intention and action. Patient should know all the risks, benefits of the procedure and likelihood of success before making the decision.

* **Beneficence**

The main aim of the procedure is to do good to the patient. Considerate the patient’s welfare.

* **Confidentiality**

Personal, medical and treatment information should be kept confidential. If the information is crucial for the patient, only in that case it can be revealed.

* **Non-Maleficence**

Making sure that the procedure doesn’t harm the patient or others in the society.

* **Justice/Equity**

Fair and equal distribution of scarce health resources and decision of who gets what treatment.

**Guidelines for the proper acquisition and manipulation of scientific digital images.**

1. Scientific digital images are data that can be compromised by inappropriate deceptionsor amnipulations.
2. Digital imagemanipulation should always be done in the data copy of the unprocessed image.
3. Simple adjustments throughout an image are generally acceptable.
4. Use of software filters to improve image quality is usually not recommended for biological images.
5. Manipulations that are specific to one area of an image and are not performed on other areas are questionable.
6. Comparable digital images should be obtained under the same conditions, and any post-acquisition image processing should be the same.
7. Cloning or copying objects into a digital image ,from other parts of the same image or from a different image , is very questionable.
8. Avoiding use of lossy compression.
9. Intensity measurements should be performed on uniformly processed image data , and the data should be calibrated to a known standard.
10. Image cropping is acceptable.

**GPU AND THE BUDGET**

GPU is basically a Graphic Processing Unit, originally designed to accelerate graphics rendering. GPUs can process many pieces of data simultaneously, making them useful for machine learning, video editing, and gaming applications. GPUs may be integrated into the computer’s CPU or offered as a discrete hardware unit. GPU accelerates display rendering, zooming, and navigation, but the bulk of the actual processing happens on the CPU. Most commonly used GPU for image processing nowadays are:

* MSI GeForce RTX 3070
* MSI RTX 3090 Gaming X Trio
* Nvidia GeForce RTX 3080
* Nvidia GeForce GTX 1660
* AMD Radeon Pro WX8200
* AMD Radeon RX 5700
* Nvidia Quadro RTX 5000
* OpenCL
* Gigabyte Aorus GeForce RTX 3080

We are using **ResNet50** as our model. ResNet50 is a residual deep learning neural network model with 50 layers. ResNet50 was the winning model of the ImageNet (ILSVRC) 2015 competition and is a popular model for image classification, it is also often used as a backbone model for object detection in an image. A neural network includes weights, a score function and a loss function. The speed of calculations for the ResNet-50 model in LeaderGPU® is 2.5 times faster comparing to Google Cloud.

**MSI GeForce RTX 3070 and MSI RTX 3090 Gaming X Trio** are best graphics card for creative and professional image processing. We will use either of the gpu.

A picture containing text, seat, chair

Description automatically generated

The **MSI GeForce RTX 3070** is powered by Ampere—NVIDIA's 2nd gen RTX architecture. Built with enhanced RT Cores and Tensor Cores, new streaming multiprocessors, and high-speed G6 memory, it gives you the power you need to rip through the most demanding games.[[1]](#footnote-1)

**Boost Clock / Memory Speed**

* TBD MHz / 14 Gbps
* 8GB GDDR6
* Display Port x 3

HDMI x 1 (Supports 4K @120Hz as specified in HDMI 2.1)

**Price**

$ 1,345.99

The **MSI GeForce RTX 3090** is a big ferocious GPU (BFGPU) with TITAN class performance. It's powered by Ampere—NVIDIA's 2nd gen RTX architecture—doubling down on ray tracing and AI performance with enhanced RT Cores, Tensor Cores, and new streaming multiprocessors. Plus, it features a staggering 24 GB of G6X memory, all to deliver the ultimate gaming experience.[[2]](#footnote-2)

**Boost Clock / Memory Speed**

* 1785 MHz / 19.5 Gbps
* 24GB GDDR6X
* DisplayPort x 3 (v1.4a) / HDMI 2.1 x 1

**Price**

$ 3,559.97

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Retail price | Street price (Dec 2020) | Street price (Mar 2021) | Current value |
| Nvidia RTX 3090 | $1,499 | $2,076 | $2,985 | 1.99x |
| Nvidia RTX 3080 | $699 | $1,227 | $2,160 | 3.09x |
| Nvidia RTX 3070 | $499 | $819 | $1,239 | 2.48x |
| Nvidia RTX 3060 Ti | $399 | $675 | $1,226 | 3.07x |
| Nvidia RTX 3060 | $329 | N/A | $828 | 2.5x |
| AMD RX 6900 XT | $999 | Did not check | $1,841 | 1.84x |
| AMD RX 6800 XT | $649 | $1,232 | $1,555 | 2.4x |
| AMD RX 6800 | $579 | $841 | $1,331 | 2.3x |
| AMD RX 6700 XT | $479 | N/A | $1,169 | 2.4x |
| PS5 (disc) | $499 | $1,024 | $833 | 1.66x |
| PS5 (digital) | $399 | $990 | $754 | 1.88x |
| Xbox Series X | $499 | $835 | $805 | 1.61x |
| Xbox Series S | $299 | $471 | $432 | 1.45x |

**CLOUD BASED GPU[[3]](#footnote-3)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ****Model**** | ****GPUs**** | ****GPU memory**** | ****GPU price (USD)**** | ****Spot price\* (USD)**** | ****1 year commitment price (USD)**** | ****3 year commitment price (USD)**** |
| [NVIDIA® A100](https://www.nvidia.com/en-us/data-center/a100/) | 1 GPU | 40 GB HBM2 | $2.939 per GPU | $0.880 per GPU | $1.848 per GPU | $1.027 per GPU |
| [NVIDIA® T4](https://www.nvidia.com/en-us/data-center/tesla-t4/) | 1 GPU | 16 GB GDDR6 | $0.35 per GPU | $0.11 per GPU | $0.220 per GPU | $0.160 per GPU |
| [NVIDIA® P4](https://www.nvidia.com/en-us/deep-learning-ai/inference-platform/hpc/) | 1 GPU | 8 GB GDDR5 | $0.60 per GPU | $0.216 per GPU | $0.378 per GPU | $0.270 per GPU |
| [NVIDIA® V100](https://www.nvidia.com/en-us/data-center/tesla-v100/) | 1 GPU | 16 GB HBM2 | $2.48 per GPU | $0.74 per GPU | $1.562 per GPU | $1.116 per GPU |
| [NVIDIA® P100](https://www.nvidia.com/object/tesla-p100.html) | 1 GPU | 16 GB HBM2 | $1.46 per GPU | $0.43 per GPU | $0.919 per GPU | $0.657 per GPU |
| [NVIDIA® K80](https://www.nvidia.com/en-gb/data-center/tesla-k80/) | 1 GPU | 12 GB GDDR5 | $0.45 per GPU | $0.038 per GPU | $0.283 per GPU | Not available in this region |
| [NVIDIA® T4 Virtual Workstation](https://www.nvidia.com/en-us/design-visualization/technologies/virtual-gpu/) | 1 GPU | 16 GB GDDR6 | $0.55 per GPU | $0.31 per GPU | $0.42 per GPU | $0.36 per GPU |
| [NVIDIA® P4 Virtual Workstation](https://www.nvidia.com/en-us/design-visualization/technologies/virtual-gpu/) | 1 GPU | 8 GB GDDR5 | $0.80 per GPU | $0.416 per GPU | $0.578 per GPU | $0.47 per GPU |
| [NVIDIA® P100 Virtual Workstation](https://www.nvidia.com/en-us/design-visualization/technologies/virtual-gpu/) | 1 GPU | 16 GB HBM2 | $1.66 per GPU | $0.63 per GPU | $1.119 per GPU | $0.857 per GPU |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |

[1] <https://us.msi.com/Graphics-Card/GeForce-RTX-3090-GAMING-X-TRIO-24G>

[2] <https://www.msi.com/Graphics-Card/GeForce-RTX-3070-GAMING-X-TRIO/Overview>

[3] <https://www.theverge.com/2021/3/23/22345891/nvidia-amd-rtx-gpus-price-scalpers-ebay-graphics-cards>

* DisplayPort x 3  
  HDMI x 1 (Supports 4K@120Hz as specified in HDMI 2.1)

1. [↑](#footnote-ref-1)
2. [↑](#footnote-ref-2)
3. [↑](#footnote-ref-3)