# Computer Build

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## 1 Parts

| Part | Spec | Amount | Power |
|---|---|---|---|
| [x] Motherboard | ASUS Prime X670-P Wifi CSM AM5 ATX Motherboard | $339.36 | 30-50W |
| [x] CPU | AMD Ryzen 9 7900X 12 Core AM5 5.6GHz CPU Processor | $599 | 170W |
| [ ] RAM | Kingston 64GB (2x32GB) KF560C36BBEAK2-64 Fury Beast RGB 6000MHz DDR5 RAM | $309 | 10W |
| [ ] Memory | Crucial T705 1TB CT1000T705SSD5 PCIe 5.0 2280 M.2 NVMe SSD - with Heatsink | $289 | 11.55W |
| [ ] Memory | Seagate Barracuda 1TB (2016) | - | |
| [ ] Cooler | Thermalright Phantom Spirit 120 SE ARGB CPU Cooler ->166mm | $59 | |
| [x] Case | Thermaltake View 200 TG ARGB Mid Tower ATX Case | $78.78 | |
| [x] GPU | RTX3090 | 350W | |
| [ ] PSU | Thermaltake Toughpower GF A3 Snow 1050W Power Supply | $219 | |
| [ ] Fans | 3x 120mm | $35 | |

# 2 1. Central Processing Unit (CPU)

The CPU is vital for data preprocessing, running ML algorithms, and managing overall system operations. For ML tasks, a CPU with high core count and strong multi-threading capabilities is essential.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **CPU** | **AMD Ryzen 9 7950X** | 16 cores / 32 threads, 4.5 GHz base, 5.7 GHz boost, AM5 socket | ~1,050 |
| | **AMD Ryzen 9 7900X** | 12 cores / 24 threads, 4.7 GHz base, 5.6 GHz boost, AM5 socket | ~750 |
| | **AMD Ryzen 7 7700X** | 8 cores / 16 threads, 4.5 GHz base, 5.4 GHz boost, AM5 socket | ~525 |

***Recommendation:***
The **AMD Ryzen 9 7950X** is highly recommended for ML development due to its high core and thread count, which enhances parallel processing capabilities essential for handling complex ML tasks and large datasets.

# 3 2. Graphics Processing Unit (GPU)

GPUs are the backbone of modern ML workloads, especially for deep learning tasks. NVIDIA GPUs are typically preferred due to their CUDA cores and extensive support in ML frameworks.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **GPU** | **NVIDIA GeForce RTX 4090** | 24 GB GDDR6X, 16,384 CUDA cores, PCIe 4.0, excellent for large-scale ML models | ~2,400 |
| | **NVIDIA GeForce RTX 4080** | 16 GB GDDR6X, 9,728 CUDA cores, PCIe 4.0, great performance for ML | ~1,800 |
| | **NVIDIA RTX A6000** | 48 GB GDDR6, 10,752 CUDA cores, ECC memory, optimized for professional ML workloads | ~6,750 |
| | **NVIDIA GeForce RTX 4070 Ti** | 12 GB GDDR6X, 7,680 CUDA cores, PCIe 4.0, balanced performance and cost | ~1,200 |

***Recommendation:***
For the best ML performance, the **NVIDIA GeForce RTX 4090** is ideal due to its superior CUDA core count and large VRAM, enabling efficient training of complex models. If budget constraints exist, the **RTX 4080** or **RTX 4070 Ti** offer excellent performance at a more accessible price.

# 4 3. Motherboard

A compatible motherboard ensures seamless integration of all components, supports multiple GPUs, offers ample RAM slots, and provides reliable power delivery.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **Motherboard** | **ASUS PRIME X670-P WIFI** | AM5 socket, 1 x PCIe 4.0 x16 slots 1 x PCIe 4.0 x8, DDR5 support, WiFi 6E, robust VRMs | ~219.99 |
| | **MSI MPG X670E Carbon WiFi** | AM5 socket, Triple PCIe 5.0 x16 slots, DDR5, WiFi 6E, high-quality VRMs | ~675 |
| | **Gigabyte X670E AORUS Elite** | AM5 socket, Triple PCIe 5.0 x16 slots, DDR5, advanced thermal design | ~600 |
| | **ASRock X670E Taichi** | AM5 socket, Triple PCIe 5.0 x16 slots, DDR5, premium build quality | ~900 |
| | **ASUS TUF Gaming X670E-Plus** | AM5 socket, 1 x PCIe 5.0 x16 slots, 1 x PCIe 4.0 x4, DDR5, military-grade components | ~749 |
| | **ASUS ProArt X670E-Creatort** | AM5 socket, 2 x PCIe 5.0 x16 slots, 1 x PCIe 4.0 x2, DDR5 | ~768 |
| | **ASUS ROG Strix X670E Gaming** | AM5 socker, 1 x PCIe 5.0 x16 slots, 1 x PCIe 4.0 x4, DDR5 | ~639 |

***Recommendation:***
The **ASUS PRIME X670-P WIFI** offers a balanced mix of features, including dual PCIe 5.0 x16

slots suitable for dual GPU setups, robust power delivery, and DDR5 memory support, making it an excellent choice for ML development.

## 5 4. Memory (RAM)

Ample and fast RAM is crucial for handling large datasets and ensuring smooth multitasking during model training and evaluation.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **RAM** | **G.Skill Trident Z5 RGB DDR5 64GB (2x32GB) 6000MHz** | High-speed DDR5, RGB aesthetics, low latency | ~450 |
| | **Corsair Vengeance DDR5 32GB (2x16GB) 6000MHz** | Reliable performance, high speed | ~225 |
| | **Kingston Fury Beast DDR5 128GB (4x32GB) 6000MHz** | Massive capacity for extensive datasets | ~900 |
| | **Crucial Ballistix DDR5 32GB (2x16GB) 5600MHz** | Budget-friendly, decent performance | ~195 |

***Recommendation:***
For most ML applications, **64 GB DDR5 RAM** (e.g., **G.Skill Trident Z5 RGB DDR5 64GB**) strikes a good balance between capacity and speed. However, for very large datasets or complex models, opting for **128 GB DDR5 RAM** (e.g., **Kingston Fury Beast DDR5 128GB**) is advisable.

## 6 5. Storage

Fast and ample storage ensures quick data access, efficient model saving/loading, and smooth system performance.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **Primary Storage** | **Samsung 980 PRO 1TB NVMe SSD** | PCIe 4.0, high read/write speeds, reliable | ~150 |
| **Secondary Storage** | **WD Black SN850X 2TB NVMe SSD** | PCIe 4.0, larger capacity for datasets | ~300 |
| | **Samsung 990 PRO 2TB NVMe SSD** | Latest generation, PCIe 4.0, extremely fast | ~375 |
| | **Crucial P5 Plus 4TB NVMe SSD** | PCIe 4.0, massive storage for extensive datasets | ~675 |
| | **Seagate FireCuda 530 1TB NVMe SSD** | PCIe 4.0, excellent endurance and reliability | ~180 |
| | **Corsair MP600 Pro XT 2TB NVMe SSD** | PCIe 4.0, robust thermal management | ~330 |

***Recommendation:***
A combination of a **1 TB NVMe SSD** for the operating system and frequently accessed data (e.g., **Samsung 980 PRO 1TB**) and a **2 TB NVMe SSD** for larger datasets and model storage (e.g., **WD Black SN850X 2TB**) is ideal. For maximum storage needs, consider adding a **4 TB NVMe SSD**.

# 7 6. Power Supply Unit (PSU)

A reliable PSU ensures stable power delivery to all components, especially when running multiple GPUs.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **PSU** | **EVGA SuperNOVA 1200 G6 1200W** | 80+ Gold, fully modular, high wattage for dual GPUs | ~450 |
| | **Corsair RM1000x 1000W 80+ Gold** | Fully modular, reliable performance | ~270 |
| | **Seasonic Focus GX-850 850W** | 80+ Gold, fully modular | ~195 |
| | **Be Quiet! Straight Power 11 1000W** | 80+ Platinum, fully modular | ~300 |
| | **Corsair HX1200i 1200W** | 80+ Platinum, high efficiency | ~450 |

***Recommendation:***
For dual GPU configurations, a **1200W PSU** like the **EVGA SuperNOVA 1200 G6** or **Corsair HX1200i** is recommended to ensure ample power headroom and stability, especially under heavy loads.

# 8 7. Cooling Solutions

Effective cooling is essential to maintain optimal performance and prolong the lifespan of your components, particularly the CPU and GPUs.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **CPU Cooler** | **Corsair iCUE H150i Elite Capellix** | 360mm AIO, RGB lighting, high-performance cooling | ~300 |
| | **Noctua NH-D15 chromax.Black** | Dual tower air cooler, extremely efficient and quiet | ~150 |
| | **be quiet! Dark Rock Pro 4** | High-performance air cooling, near-silent operation | ~135 |
| | **NZXT Kraken Z73 RGB** | 360mm AIO, customizable LCD display, premium cooling | ~375 |
| | **Arctic Liquid Freezer II 360** | 360mm AIO, excellent cooling performance | ~225 |

***Recommendation:***
For optimal CPU cooling, consider a **high-performance AIO liquid cooler** like the **Corsair iCUE H150i Elite Capellix** or a top-tier **air cooler** like the **Noctua NH-D15 chromax.Black**. These options ensure your CPU remains cool during intensive ML tasks.

# 9 8. Computer Case (Chassis)

A spacious and well-ventilated case ensures that all components, especially multiple GPUs, have adequate airflow and space.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **Case** | **Fractal Design Meshify 2** | ATX, excellent airflow, spacious interior | ~225 |
| | **Thermaltake Core P8** | ATX, open-frame design, maximum airflow | ~300 |
| | **NZXT H710** | ATX, sleek design, good cable management | ~240 |
| | **Lian Li PC-O11 Dynamic** | ATX, stylish with excellent cooling and showcase features | ~225 |
| | **Phanteks Eclipse P600S** | ATX, hybrid cooling support, sound-dampening | ~300 |
| | **Corsair Obsidian Series 750D** | ATX, large and versatile, robust build quality | ~255 |

***Recommendation:***
For dual GPU setups, the **Fractal Design Meshify 2** or **Thermaltake Core P8** are excellent choices due to their spacious interiors and superior cooling support, ensuring that multiple GPUs can operate efficiently without overheating.

# 10 9. Operating System

Choose an OS that best supports your ML tools and frameworks. **Ubuntu** is widely used in ML environments due to its compatibility and support for NVIDIA drivers and ML frameworks.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **Operating System** | **Ubuntu 22.04 LTS** | Free, widely supported in ML environments | 0 |
| | **Windows 11 Pro** | Comprehensive support for various ML tools | ~210 |

***Recommendation:***
**Ubuntu 22.04 LTS** is highly recommended for ML development due to its robust support for NVIDIA drivers, compatibility with popular ML frameworks like TensorFlow and PyTorch, and extensive community support.

## 11 10. Networking (Optional)

For distributed ML workloads or high-speed data transfers, high-speed networking can be beneficial.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **Network Card** | **Intel X550-T2 10GbE** | Dual 10 Gigabit Ethernet ports, PCIe 3.0 | ~450 |
| | **ASUS XG-C100C 10Gb Ethernet** | PCIe 3.0, reliable performance | ~225 |

***Recommendation:***
If your ML workflows involve significant data transfers over the network, consider adding a **10Gb Ethernet Card** like the **Intel X550-T2** for high-speed connectivity.

## 12 11. Peripherals (Optional)

Quality peripherals can enhance your workflow and overall user experience.

| Component | Recommendation | Key Features | Price Range (AUD) |
|---|---|---|---|
| **Monitor** | **Dell UltraSharp U2720Q** | 27-inch 4K, IPS panel, excellent color accuracy | ~900 |
| | **LG 27GN950-B** | 27-inch 4K, IPS, high refresh rate | ~1,200 |
| **Keyboard** | **Logitech MX Keys** | Ergonomic, wireless, backlit | ~150 |
| | **Corsair K95 RGB Platinum** | Mechanical, RGB lighting, programmable keys | ~300 |
| **Mouse** | **Logitech MX Master 3** | Ergonomic, wireless, multiple programmable buttons | ~150 |
| | **Razer DeathAdder V2** | High-precision sensor, ergonomic design | ~105 |
| **External Storage** | **Samsung T7 Portable SSD 2TB** | Fast USB 3.2 connectivity, portable | ~375 |
| | **WD My Passport 4TB** | Large capacity, reliable performance | ~180 |
| **Uninterruptible Power Supply (UPS)** | **APC Back-UPS Pro 1500VA** | Reliable backup power, surge protection | ~375 |
| | **CyberPower CP1500PFCLCD** | Pure sine wave, LCD display, high capacity | ~300 |

***Recommendation:***
Investing in high-quality monitors like the **Dell UltraSharp U2720Q** and ergonomic peripherals like the **Logitech MX Keys** and **MX Master 3** can significantly enhance your productivity and comfort during long ML development sessions.

# 13 Complete Component List for an AMD-Based ML Development PC

| Component | Recommendation | Price (AUD) |
|---|---|---|
| **Motherboard** | ASUS PRIME X670-P WIFI CSM DDR5 AM5 ATX | 450 |
| **CPU** | AMD Ryzen 9 7900X | 750 |
| **GPU** | NVIDIA GeForce RTX 4090 | 2,400 |
| **RAM** | G.Skill Trident Z5 RGB DDR5 64GB (2x32GB) 6000MHz | 450 |
| **Primary Storage** | Samsung 980 PRO 1TB NVMe SSD | 150 |
| **Secondary Storage** | WD Black SN850X 2TB NVMe SSD | 300 |
| **CPU Cooler** | Corsair iCUE H150i Elite Capellix (AIO Liquid Cooler) | 300 |
| **Power Supply** | EVGA SuperNOVA 1200 G6 1200W, 80+ Gold Fully Modular | 450 |
| **Case** | Fractal Design Meshify 2 | 225 |

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450 + 1050 + 2400 + 450 + 150 + 300 + 300 + 450 + 225 - 2400
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3375
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# 14 Additional Tips for Building an ML Development PC

1. **Ensure Compatibility**: Double-check that all components are compatible with each other, especially the motherboard, CPU, and RAM. Use tools like PCPartPicker to verify compatibility and prevent issues during assembly.
2. **Prioritize Cooling**: ML workloads generate significant heat, especially with dual GPUs. Invest in high-quality cooling solutions to maintain system stability and prolong component lifespan.
3. **Cable Management**: A well-organized build not only looks clean but also promotes better airflow. Use modular PSUs and manage cables efficiently within the case.
4. **Future-Proofing**: Select components that offer room for upgrades, such as additional RAM slots, PCIe lanes, and storage options, to accommodate growing ML demands.
5. **Driver and Software Setup**: After assembling your workstation, ensure that you install the latest drivers for your GPU (NVIDIA) and set up ML frameworks like TensorFlow, PyTorch, and others with GPU support.
6. **Backup Solutions**: Implement regular backup strategies to protect your datasets and models. Consider using both local (external SSDs) and cloud-based backup solutions.

7. **Monitor Cooling and Performance**: Use software tools to monitor system temperatures and performance metrics to ensure that your ML tasks are running efficiently without thermal throttling.

# 15 Computer Setup

- proxmox server
  - Ubuntu
  - Windows
  - NAS
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