Budget Justification and Allocation

The total requested budget for the CausalPCa project is **€3,243,919** over a period of 36 months. This budget is the result of a rigorous planning process to ensure all necessary resources are allocated to achieve the ambitious objectives outlined in this proposal, while delivering maximum value for money. The costs are broken down by Work Package (WP) and cost category, with detailed justifications provided below. All costs are estimated in EUR.

A. Direct Costs

A.1 Personnel Costs

Personnel costs are the most significant part of the budget, reflecting the highly skilled, interdisciplinary team required for this project. Integrating advanced imaging, clinical data, and multi-omics data requires a diverse team with expertise in nuclear medicine, radiology, data science, mathematics, and software engineering. Costs are calculated for a 36-month project duration based on institutional salary tables (TV-L), including all social security contributions. A total of **282 person-months (PMs)** are budgeted.

- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - PI (1 FTE, 36 PMs):** €263,141
- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - PhD Student (3 FTEs, 108 PMs):** €789,423
- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - Mathematician (0.5 FTE, 18 PMs):** €131,571
- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - Data Scientist (1 FTE, 36 PMs):** €263,141
- **Technical Staff (Technischer Angestellter) - Programmer (2 FTEs, 72 PMs):** €405,966
- **Technical Staff (Technischer Angestellter) - Project Manager (0.5 FTE, 18 PMs):** €101,492
- **Student/Research Assistant (Wissenschaftliche Hilfskraft) (40hrs/month, 36 months):** €33,040

Total Estimated Personnel Costs: €1,987,774

Personnel Justification

The personnel budget is structured to support the project's ambitious goals through a dedicated, interdisciplinary team. The justification for each role is as follows:

- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - PI (1 FTE, 36 PMs):** The PI role will be shared by two individuals, each dedicating 50% of their time to the project. They will jointly provide the overall scientific vision and leadership, ensuring the project stays on track and meets its objectives. They will coordinate the complex, interdisciplinary work across all WPs and lead the high-level scientific dissemination and exploitation activities (WP6, WP7).
- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - PhD Student (3 FTEs, 108 PMs):** Three PhD students are critical for the project's execution. Their roles are multifaceted, involving the crucial tasks of data curation, cleaning, and annotation across all data modalities, including imaging, histopathology, and omics data. They will also be instrumental in implementing and training the AI models and conducting the rigorous experimental validation needed to ensure their robustness and accuracy. Their work will directly support the clinical teams in urology, nuclear medicine, radiology, and histopathology and will form the foundation of their doctoral theses.

- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - Mathematician (0.5 FTE, 18 PMs):** A half-time mathematician is required to provide the essential theoretical support for the novel causal models being developed. This role will focus on ensuring the mathematical soundness of the framework, particularly the complex Neural Jump ODEs (WP4), and will contribute to the development of robust uncertainty quantification methods.
- **Scientific Staff (Wissenschaftlicher Mitarbeiter) - Data Scientist (1 FTE, 36 PMs):** A dedicated data scientist is vital for managing the project's complex and heterogeneous data. This role will oversee the entire data pipeline, from curation and harmonization (WP1) to secure storage and access, ensuring the integrity and usability of the data for all technical work packages.
- **Technical Staff (Technischer Angestellter) - Programmer (2 FTEs, 72 PMs):** Two full-time programmers are required to build the robust, scalable, and production-ready software that forms the backbone of this project. They will be responsible for the end-to-end software engineering, including developing the data processing pipelines, implementing the AI models with a focus on efficiency and optimization, and creating the user-facing clinical validation tools.
- **Technical Staff (Technischer Angestellter) - Project Manager (0.5 FTE, 18 PMs):** A part-time project manager is essential for the operational success of this multi-partner project. This role extends beyond standard administrative duties to include coordinating data sharing and harmonization between the collaborating clinics, managing the grant documentation and reporting to the EC, and actively tracking development logs to ensure all project activities are compatible with the principles and requirements of the EU AI Act (WP7).
- **Student/Research Assistant (Wissenschaftliche Hilfskraft) (40hrs/month, 36 months):** A part-time research assistant will provide essential support for the data collection efforts and the clinical validation studies in WP5, assisting with patient data management and study logistics.
- **Clinical Consultations:** A dedicated budget for small monthly consultations with external experts in urology, histopathology, and radiology is included to ensure that the project's development remains clinically relevant and grounded in real-world practice.

A.2 Equipment Costs

The requested budget of €536,000 for computational resources represents a strategic, one-time capital investment in the core enabling technology of this project. This on-premise infrastructure is not an operational overhead but the central scientific instrument—the **primary discovery engine**—required to achieve the project's groundbreaking ambition. The amount is based on a detailed analysis of the project's workload and market pricing for state-of-the-art AI hardware.

Table 1: The Revised Computational Resource Budget (3 Years)

Cost Category	Year 1 (€)	Year 2 (€)	Year 3 (€)	Total (€)
NVIDIA DGX B200 System	489,000	0	0	489,000
300 TB Storage Solution	28,000	0	0	28,000
Installation & Integration	19,000	0	0	19,000
TOTAL	**536000**	**0**	**0**	**536000**

1. Strategic Imperative: An NVIDIA DGX B200 as the Project's Cornerstone To pursue the project's visionary goal of creating a causal AI framework for medicine, an investment in computational power that is commensurate with the scale of the scientific challenge is required. The budget is therefore centered on the acquisition of an **NVIDIA DGX B200 system**. This is not a conventional server but a purpose-built, integrated AI supercomputer that directly addresses the primary technical risks of the project.

2. Justification for the DGX B200 Solution The choice of the DGX B200 is driven by key technical requirements of the proposed research:

- **Solving the VRAM Bottleneck:** The project's focus on high-resolution 3D medical imaging is severely limited by GPU memory (VRAM). The DGX B200 provides a massive **1.44 TB of unified, high-bandwidth GPU memory**, which is essential for training the large, complex 3D VAE and Diffusion Models at the heart of our methodology. This capability is critical to de-risk the core of the project.
- **Powering Complex, Multi-Stage Workflows:** Our four-stage causal framework requires intensive, iterative re-training cycles. The DGX B200's architecture, with eight tightly interconnected GPUs, is engineered for exactly this kind of complex, distributed workload, ensuring maximum efficiency for model development.
- **Turnkey Solution to Reduce Engineering Overhead:** As a fully integrated and validated platform, the DGX B200 allows the research team to focus immediately on scientific discovery rather than spending months on system integration and debugging. It includes the necessary NVIDIA AI Enterprise software and support, accelerating the timeline from deployment to discovery.
- **High-Throughput Data Processing:** The system's architecture, including features like GPUDirect Storage, is optimized to handle the large-scale (200-400 TB) multimodal datasets of this project, ensuring the powerful GPUs are never left "starved" for data.

3. Storage and Integration To complement the DGX B200, the budget includes a **300 TB enterprise storage solution** and the mandatory **professional installation and integration services**. This ensures the entire system is deployed correctly, validated, and ready to support the project's ambitious research agenda from day one. This on-premise solution provides a cost-effective and secure way to manage the project's large data assets without the variable ongoing costs of cloud storage. Should market conditions allow for the procurement of this hardware at a lower cost than budgeted, any remaining funds will be re-allocated to secure cloud solutions to further enhance the project's computational flexibility.

Total Estimated Equipment Costs: € 536,000

A.3 Travel Costs

The travel budget is allocated for project meetings and dissemination of project results at leading international conferences.

- **Project Meetings (3):** Budget for travel and accommodation for the project team and key external collaborators to attend a kick-off meeting (M1 in Magdeburg), a mid-term review meeting (M18), and a final project meeting (M36 in Magdeburg).
- **International Conferences (6):** Budget to allow key personnel (PI, PhDs, Programmers) to present project findings at major international conferences such as RSNA, ECR, MICCAI, and NeurIPS. This is crucial for WP6 (Dissemination).

Total Estimated Travel Costs: € 32,500

A.4 Other Direct Costs

This category includes costs for publications, dataset access, and other minor expenses.

- **Open Access Publication Fees:** To comply with Horizon Europe's open science mandate, we have budgeted for Article Processing Charges (APCs) for an estimated 10 high-impact journal publications.
- **UK Biobank Access:** A fee of € 12,000 is budgeted for access to the UK Biobank dataset.
- **Software Licenses:** A provision of € 36,000 is budgeted for specialized software licenses.
- **Clinical Consultations:** A budget of € 54,000 is allocated for small monthly consultations with external experts in urology, histopathology, and radiology.

Total Estimated Other Direct Costs: € 112,000

B. Indirect Costs (Overheads)

Indirect costs are calculated as a flat rate of **20% of the total direct costs**, in accordance with Horizon Europe rules. These costs cover general institutional overheads.

Total Direct Costs (A): €2,668,274

Indirect Costs (B = 20% of A): €533,655

C. Total Project Budget

The total requested funding is the sum of total direct and indirect costs.

Total Estimated Project Cost (A + B): €3,201,929

Budget Allocation per Work Package (in EUR)

Table 2: Estimated Budget Allocation per Work Package

Work Package	Direct Costs	Indirect Costs	Total Cost
WP1: Data Curation	450,000	90,000	540,000
WP2: Supervisor Models	523,000	104,600	627,600
WP3: Causal VAE	583,000	116,600	699,600
WP4: Temporal Modeling	523,000	104,600	627,600
WP5: Validation	200,000	40,000	240,000
WP6: Dissemination	110,000	22,000	132,000
WP7: Project Management	279,274	55,855	335,129
Total	**2668274**	**533655**	**3201929**