

# Job Descriptions

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# Synthetic Data Engineers

# TEKsystems - Apple

# TEKsystems - Apple

Synthetic Data Software Engineer - our client makes the newest technologies accessible to create amazing user experiences. You will have the opportunity to work in a multi-functional team to provide synthetic character data to develop innovative computer vision and machine learning algorithms. We are looking for a synthetic digital human software engineer who has exceptional knowledge and experience in computer graphics and visual effects for character development. You will need a keen understanding and deep experience in all aspects of character development - photogrammetry, shading/rendering, rigging, simulation, and pipelines for offline and real-time environments. You will be responsible for solving character problems, managing and troubleshooting synthetic data generation.

## **Skills:**

Python, maya, Houdini, 3D, 3d graphics, 3d graphics software, character rigging, 3d geometry, Linear Algebra, C++, Synthetic Data, Shading, Rendering

## **Top Skills Details:**

Python,maya,Houdini,3D,3d graphics,3d graphics software,character rigging,3d geometry,Linear Algebra

## **Additional Skills & Qualifications:**

- Programming skill in C/C++ is a bonus
- Experience in generating synthetic data for computer vision problems is a big bonus
- Good understanding of modern shading/rendering methodologies such as PBS/PBR, IBL
- Hair/cloth simulation setup/pipeline experience is a plus

## **Experience Level:**

Expert Level

## FIRST ROUND

- someone that fulfills every one of those requirements are either working for 20+ years or lacks the fidelity in those departments.
- Digital Humans
  - Rendering using post production VRAY, then deferred look, then forward look, then headset
  - Getting rid of FACS blendshapes for performance
  - at ML focused on scanning pipeline
  - At Samsung focused on QC pipeline and MAM
  - give high level overview of Metahumans pipeline and how it compares to traditional
- 3D Geometry
  - basic 3d character pipeline, UVS and matching topology
- Character Rigging
  - IK FK, skin weights.
  - machine learning methods
    - meshcapade
    - quick rigging tool in maya
    - A Stance, T Stance helper joints
    - smooth select when weight painting
  - mocap, traditional vs cv based
- Python
  - basic ds and a and how it applied to python
  - pep8
  - Some design patterns
- Prototyping (Pipelines)
  - What makes a MVP
  - Validating it works ASAP
    - testing with thirdparty before writing own implmentation
    - architecting the solution in python, then handing it to SWE to code in C++
      - examples. keying, carrying multiple layers for real time
- Synthetic Data
  - How we use ML in pipeline
    - concept art gen ai
    - rigging meshcapade
    - building the new pipeline for modern era, generalists over specialists
  - Talk about building the hand scanning pipeline for ML headset for CV
    - built using reality capture license bound
  - Talk about building 3d head generator for ML that is used for CV
    - built using metashape not license bound
    - @SRA , talk about purchasing heads over building solid scanning system
    - working with ML engineers

- Benefits of synthetic data over real data
  - privacy!
  - generate whatever you want and narrow down requirements
  - Get real data (scan or purchase from RenderPeople), ML model that generates different heads... then use that model to test computer vision.
    - look at microsoft stuff
    - Talk about siggraph papers
- how it applies to training CV <https://www.youtube.com/watch?v=6Bts8WeZ6nA>

from chatgpt

The dot product is a mathematical operation that has various applications in computer graphics and technical art. Technical artists often use the dot product for tasks related to shading, lighting, and geometry. Here are some specific applications of the dot product in the context of technical art:

1. **Lighting and Shading:** The dot product is commonly used in lighting calculations, such as the Phong reflection model. In this model, the dot product of the surface normal and the light direction vector is used to determine the amount of diffuse and specular reflection at a given point on a surface. This helps create realistic lighting effects in computer-generated images.
2. **Normal Mapping:** Normal mapping is a technique used to add fine surface details to 3D models without increasing the model's geometry. The dot product is often employed to transform per-pixel normal maps into the space of the rendered surface, allowing for accurate lighting calculations based on the details provided by the normal map.
3. **Culling and Visibility:** The dot product is used in techniques like backface culling, where the dot product of the surface normal and the view direction is checked to determine whether a polygon is facing toward or away from the camera. This information is crucial for optimizing rendering by skipping the rendering of surfaces facing away from the viewer.
4. **Reflection and Refraction:** The dot product is involved in calculations related to reflection and refraction of light rays. When simulating reflective or refractive materials, technical artists use the dot product to compute the reflection and refraction vectors, allowing for realistic rendering of materials like glass or water.
5. **Orientation and Alignment:** Technical artists may use the dot product to determine the alignment or orientation of objects in a scene. This information can be useful for various purposes, including procedural generation, animation, and rigging.
6. **Geometry Operations:** In certain cases, the dot product is used for geometric operations, such as checking if two vectors are orthogonal (have a dot product of zero) or finding the angle between two vectors.

In summary, the dot product is a versatile mathematical operation that technical artists use in various aspects of computer graphics and rendering to achieve realistic and visually appealing results.

Here are some applications of the cross product in the context of technical art:

1. **Normal Vector Calculation:**
  - One of the primary uses of the cross product is in computing normal vectors for surfaces. Given two vectors lying in the plane of a surface, the cross product provides a vector that is perpendicular to that surface. Normal vectors are essential for lighting calculations and shading in 3D graphics.
2. **Tangent and Bitangent Calculation:**
  - In texture mapping, the cross product can be used to calculate tangent and bitangent vectors, which are crucial for mapping textures onto 3D surfaces, especially in normal mapping techniques.
3. **Orientation and Rotation:**
  - Technical artists use the cross product to determine the orientation of objects or to calculate the rotation axis when performing rotations in 3D space. This is valuable for rigging and animation tasks.
4. **Culling:**
  - In addition to the dot product, the cross product is used for backface culling. By comparing the result of the cross product of two vectors (edges of a polygon), the orientation of the polygon in relation to the camera can be determined.
5. **Collision Detection:**
  - The cross product is involved in collision detection algorithms, particularly in determining the direction of the collision response force when two objects collide.
6. **Angular Momentum and Torque:**
  - In physics simulations and game development, the cross product is used to calculate angular momentum and torque, providing realistic rotational behavior for objects.
7. **Quaternion Rotation:**
  - Quaternions, which are often used to represent rotations in 3D space, involve the cross product. The cross product of two vectors can be used to construct a quaternion that represents the rotation between them.
8. **Volumetric Effects:**
  - In certain rendering techniques, such as volume rendering or fluid simulations, the cross product is used to calculate vorticity or rotational aspects of the fluid flow.
9. **Procedural Generation:**
  - The cross product is employed in procedural generation algorithms, especially when creating diverse and natural landscapes. It can be used to generate variations in terrain features or patterns.
10. **Particle Systems:**
  - When simulating particle systems, the cross product is used to determine the rotational forces acting on particles, allowing for realistic spinning or rotation effects.

Terminology water tight

# Technical Artists

# Lead Technical Artist - Hasbro

We're looking for an outstanding **Lead Technical Artist** to join us on an exciting unannounced science fiction game! You'll head up a team building the art tools and pipelines required for a AAA game based on the latest Unreal technology. As a leader you will partner with the Art Director to prioritize and architect the tools our cross-discipline artists will use to make our games.

As a developer you are a specialist in your field, combining artistic skill with technical know-how in programming or scripting. You bring a breadth of knowledge that ideally covers several of the artistic fields needed to build compelling visuals in engine. You understand the importance of art workflows and pipelines on the efficiency of an art team and understand emerging trends and technologies in video game content.

If you have experience both as an artist and technologist we'd love to tell you more about what we're working on!

## **What You'll Do:**

- Coordinate internal R&D for Art tools, production pipelines, and content creation.
- Lead and mentor other Tech Artists on the team.
- Partner with the Production Art Director in building a strategy and schedule for tools and pipeline construction. Collaborate with the rendering team to define art-related performance targets and budgets, and supervise the creation of tools to measure progress.
- Work hands-on to build and develop new Art tools.
- Analyze tool usage by the Art team to refine and streamline processes.
- Identify new tools and technologies to improve content production.

## **What You'll Bring:**

- 5+ years experience in Art tool and pipeline creation for interactive entertainment.
- Broad knowledge across several art subject areas, including environment, character, VFX, UX, lighting, shading, and rendering.
- Technical experience with tool-related programming and scripting.



- Thorough understanding of video game development, art processes, and production pipelines.
- Experience with Unreal engine is ideal.
- Experience leading, developing, and mentoring and inspiring a technical team to create outstanding art tools.
- Ability to foster a dynamic and collaborative team environment.
- College education or equivalent experience in related arts and technical field (CS, engineering, programming, scripting).

# 3D Software Engineer

# 3d Animation Software Engineer

NVIDIA is looking for a highly motivated and experienced 3d Animation Software Engineer to join the Digital Human Technology team! We are looking for an engineer to support and contribute to the productization of innovative digital human animation solutions. The desired engineer will participate in the creation of new animation generative AI to deliver high quality solutions for digital human animation.

## What You'll Be Doing

- Push the boundary of generative AI for facial and body animation.
- Design, build and deploy C++ 3d libraries that bridge AI and traditional technic to tackle hard animation problems.
- Work closely with research team to improve AI model and integration.
- Write highly optimized cross-platform C++/CUDA code
- Optimize algorithms and build benchmark.
- Support tech integration into microservice
- Integrate our various technology into Omniverse for visualization and demo.

## What We Need To See

- Bachelor's degree in computer science, or related engineering, or equivalent experience
- 10+ years of experience
- Background in mesh deformation, skeletal animation systems, experience in planners, behavior trees, decision trees, task frameworks, sensors, spatial reasoning and more.
- Proven knowledge of C++ and Python
- Good knowledge of PyTorch, NumPy and SciPy
- Strong linear algebra and general math skills
- Detailed knowledge of data structures and algorithms
- Knowledge of inferencing and how AI models are built and optimized.

## Ways To Stand Out From The Crowd

- Deep learning experience for animation.
- Knowledge of tensorRT and onnx.
- Working experience with USD
- Development experience with CUDA
- Self-motivated towards team goals

NVIDIA is widely considered to be one of the technology world's most desirable employers. We have some of the most forward-thinking and hardworking people in the world working for us. Are you creative and autonomous? Do you love the challenge of crafting the highest performance & lowest power silicon possible? If so, we want to hear from you.

The base salary range is 216,000 USD - 414,000 USD. Your base salary will be determined based on your location, experience, and the pay of employees in similar positions.

You will also be eligible for equity and benefits . *NVIDIA accepts applications on an ongoing basis.*

NVIDIA is committed to fostering a diverse work environment and proud to be an equal opportunity employer. As we highly value diversity in our current and future employees, we do not discriminate (including in our hiring and promotion practices) on the basis of race, religion, color, national origin, gender, gender expression, sexual orientation, age, marital status, veteran status, disability status or any other characteristic protected by law.