Artificial intelligence (AI) specialists in Games design and programming

For more information about being a games developer please refer to the Prospects profile which has more detailed information about work activities, requirements, training, sources of vacancies and useful links – in this folder, or at www.prospects.ac.uk

AI in games

- AI is used in games to help to create characters that have a choice of responses to games player's actions, but have to be able to act in a fairly unpredictable fashion. Today it is almost impossible to write professional style games without using at least some aspects of AI.

- Game players now expect the game environment and virtual characters to behave as realistically as they are depicted. This means the full power of ordinary language and the ability for the game to “improvise” narrative content that unwinds in an unpredictable and open-ended way. It also requires non-player characters, on their own, to interact with their virtual environments and game players in convincing ways.

- AI can be a misnomer - there are few games that use neural nets, genetic algorithms or agent technology (although there are some, and the technology is slowly becoming more popular). In many cases, game AI consists of some fairly simple state machine style control with some clever but fixed ways to solve a problem, or just throwing the brute force of the CPU at a problem until it goes away. Nonetheless, as many other aspects of games (particularly in the PC world) are being accelerated away by hardware, the CPU is free for long enough for some really clever AI to be run, making games even more playable and dynamic.

- Certain games, including role-playing and strategy games, rely heavily upon AI technology.

- For example, one of the common features of real time strategy games is large portions of open terrain in the game playing field. While it is a relatively simple function for a programmer to have a game character navigate across an open area, it requires a certain level of skill to avoid traffic jams when a number of characters or objects are in close proximity to each other. Characters also need to be able to move around a map or landscape without bumping into walls - which is more difficult than it might sound.
The Job

- AI specialists work in the development of computer games as AI designers and AI programmers.
- AI specialists design and develop the technology in game systems that simulate life-like human behaviour and characteristics; many programmers are now exclusively specializing in AI whereas they have previously been more generalist.
- AI programmers commonly programme enemy tactic, strategy, and pathfinding systems and establish guidelines for how the various characters in a game will behave and respond to a gamer’s actions.
- The important thing from the perspective of this industry is that an AI programmer makes the CPU appear to play intelligently whether this means working on the game from the start, developing the AI hand-in-hand with the rest of the game, or bolting it on at the end.
- While it is important to keep up with and understand academic AI concepts, a practical AI programmer must also be able to code and implement actual, non-theoretical game behaviours, and keep it all happening in real-time without a huge processor hit. This may require a multiplicity or combination of tactics, or even a disregard for the purer methods in favour of a quick-and-dirty solution. Above all, the AI programmer needs to know the appropriate method for the task at hand. It’s frequently a job of determining the best way to make things "look" smart at a minimal processing cost.

Education and requirements

- If you are interested in working on video game AI, then you need to be a skilled programmer in this area – programming experience is a prerequisite for all jobs.
- The best route to becoming an AI programmer is to get a good foundation of programming knowledge and some experience working in the industry and then starting to specialize in this area.
- Undergraduate degrees which give students a good knowledge of computer languages and mathematics, are an excellent foundation for programmers.
- As well as a degree employers demand evidence of practical experience and knowledge. Examples of your work will be crucial if you don’t have industry experience. There is lots of advice about creating demos, including a section specifically for AI programmers on the datascope website: [www.datascope.co.uk/graduate_advice_programmer.html](http://www.datascope.co.uk/graduate_advice_programmer.html)
- As AI can vary so wildly in its definition, here’s a range of things that you may be required to know:
  - Psychology
  - State Machines
  - Physics (to understand how the AI players interact with their environment)
Path finding, patterns, and decision trees
Routing (a fantastically common AI problem)
Graph and Network theory
Neural Network theory
Genetic Algorithm theory
How to convert things we do every day into a general routine (i.e. catching a ball, working out when to attack and when to run)

Prospects

- Creating computer games requires formidable technical skills, thus the need for graduates with first-rate abilities in software development is growing at an incredible rate.
- Pricewaterhouse Cooper predicts that global video game revenues will grow from US$42 billion to US$68 billion over the next three years.
- According to the U.S. Bureau of Labor Statistics, employment in all computer-related fields is expected to grow faster than the average for all occupations until at least 2016, and that includes the career of AI specialists. Competition will be intense for positions in the computer game industry. AI specialists with master’s degrees or doctorates may well have the best opportunities.
- One of the fastest growing employers of AI graduates is the computer games industry.
- Artificial Intelligence is widely regarded in the computer games industry as the area where the largest strides in gameplay will be made in the coming decades.
- Most video game development companies assign between 10-20 percent of their programmers to work on AI related projects.

Sample Job advertisements for AI specialists in Games

Please note: The following are sample job adverts for AI specialists collected during December 2010, they may not be graduate entry positions, but show the kind of positions available and the experience and knowledge required.

AI Programmer - Rockstar North

Description

Rockstar North is currently seeking an experienced AI programmer. Commercial games experience is essential with at least three years and one published title on PS3 or Xbox 360 to demonstrate your skills. We are looking for a talented engineer to help us in developing advanced Character and Vehicle AI for large scale games. You should have a positive attitude, a
passion for games and be able to communicate with people as effectively as you do a computer.

**Responsibilities:**
- Develop, maintain and extend current AI systems on Xbox 360 and PS3.
- Design and implement advanced and realistic AI to create an immersive game experience for the player.

**Requirements:**
- Strong C/C++ programming skills
- Strong OO design skills
- Strong 3D maths skills
- At least 3 years commercial games programming experience with an emphasis on AI.
- A passion for games and in particular for creating game AI that contributes to an interactive and realistic game experience.

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**AI PROGRAMMER - Relic Entertainment**

*Canada*

At Relic, we value work-life balance. And we don’t just talk about the concept - we live it. We manage projects to deliver the highest quality games within reasonable timeframes and budgets, and we enjoy a stable and supportive relationship with our parent company, THQ, one of the world’s largest publishers.

**Summary:**

The AI Programmer takes responsibility for the analysis, design, direction and implementation of the Artificial Intelligence systems in Relic’s next great action game.

**Responsibilities:**
- Create technical specifications for AI systems that meet the requirements of the game design
- Take ownership of assigned tasks and be able to work with minimal supervision
- Interface with the game design team and incorporate feedback
- Interact with on-site and off-site AI experts to effectively plan, share and advance AI development across all Relic’s development teams
- Produce clean, maintainable, well-documented code in adherence to internal standards
- Actively participate in team by making recommendations on how to improve product quality as well as group productivity
- Assist in other areas of game development as requested by Lead Programmer or Producer

**Requirements:**
- Minimum of 2 years experience in the video game industry, with a focus on AI or formal background & applicable experience in AI development in academia or a corporate environment
• Education in Computer Science, Engineering or Mathematics and/or experience in computer graphics, animation, numerical methods, linear algebra, vision, and computational intelligence; degree required for foreign workers
• Strong understanding of C++
• Strong mathematics skills including trigonometry, calculus and linear algebra
• Demonstrated knowledge of video game AI programming techniques
• Demonstrated knowledge of good software engineering practices
• Demonstrated ability to work in a dynamic and collaborative team environment
• Proven ability at successful multi tasking under considerable pressure
• An avid game player and strong interest in pushing the industry forward creatively

**Not essential, but definite assets:**
• Xbox 360 or PlayStation 3 Console Experience
• Experience with FPS or other action combat titles
• Experience with game scripting languages
• Experience with Windows development environment such as Microsoft Visual Studio
• Experience with source control software such as Perforce
• Basic knowledge of game content pipeline and tools such as Max, Maya and Photoshop

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**AI Programmer- C++ at Motus Games**

**Category : Software Engineer**

Motus Games AI programmers are responsible for the coding wizardry that will fuel the next-generation of motion-based games.

**What you will do:**
- Working on improving our artificial intelligence APIs
- Analyzing, organizing, and optimizing code
- Providing input on design and code architecture decisions
- Working with the AI team to continuously improve the user experience and performance of the AI components of our API
- Other duties may be assigned as needed

**What you will need:**

**Interpersonal Skills**
- Attention to detail, creativity, technical zeal, great communication skills and a willingness to learn from and teach others
- Good people skills and collaborative attitude
- Good instincts for software design and fun
- An ability to stay positive and productive under pressure

**Technical Skills**
- Bachelor’s degree from a four-year college or university; or two to four years related experience and/or training; or equivalent combination of education and experience
- Strong Math, Physics, Statistics and Artificial Intelligence Skills
Other Valuable Skills

- Fluency in C++
- Having worked on a project from beginning to end
- 2 – 5 years of solid programming experience
- Understanding of procedural and object oriented programming paradigms
- Interest in sports and video games

Senior/Lead AI Programmer

Type: Permanent
Location: Frankfurt, Germany
Salary: DOE
Company: Crytek

Crytek is a Games development company founded in 1999. The main office is located in Frankfurt am Main, Germany with development studios in Budapest, Hungary and Kiev, Ukraine. Crytek is dedicated to the creation of high-quality video games for PC and next generation consoles and 3D-Game-Technologies such as the CryENGINE® game engine. The company's goal is to provide gamers with an intuitive user interface, innovative exciting gameplay, and revolutionary atmospheric visuals. To achieve this, Crytek has developed a highly advanced 3D Engine, the CryENGINE®, to surpass both today's and tomorrow's expectations for blockbuster games. In addition to the in-house development of complete games, Crytek also licenses it's technology for use in other developer's game products.

Crytek's development team is comprised of game professionals from 27+ different nations. Crytek's office language is English. Crytek Games are probably best known for the Crysis and Far Cry series of games. With our latest projects we are looking to build on this pedigree and create the next wave of jaw dropping, ground breaking games.

Our Senior/Lead AI Programmer must have:

- 5 years+ experience in the games industry
- Developed an AI system for at least 2 high-profile titles
- Has worked in a lead position before
- Experience in state-of-the-art AI technology
- Experience in multiplatform development and making multiplayer games
- Debug and optimize NextGen Console and PC performance.
- Excellent C++ skills
- Excellent problem-solving skills
- Excellent software design skills
- Excellent communication, interpersonal and organizational skills (must deal with non-programmers)
- Excellent mathematical skills
- Deep understanding of animation and physics systems
- Willing to relocate to Frankfurt am Main/Germany
- Takes initiative and is willing to expand his own horizon
- Passion for making games
- Ability to contribute innovative and original ideas towards all aspects of game production and development
- Willing to accept and provide direction, work well under pressure, and handles multiple tasks
- Experienced in providing mentorship to junior programmers
- STL experience

Preferences:
- Has used UML or some similar modelling approach in the past
- Experience with scripting languages (e.g. Lua)
- Experience with multithreading
- Experience writing technical documentation
- Published contribution to AI research
- Experience with agile methodology

Responsibilities:
- Responsible for the technological vision, research and future roadmap of the team
- Provide technological direction and leadership to the team members
- Research cutting-edge AI system design and techniques
- Develop an AI system for a high profile game engine
- Supervise a team of AI programmers and assist in work process when necessary
- Maintaining the teams backlog
- Responsible for the planning process and daily operation of the team
- Communicate teams status updates and risks to the R&D Manager
- Mentor and inspire junior programmers