

A Mature Profession of Geographic Information Systems Professionals In Puerto Rico

Raúl Matos Flores

Graduate Coordinator

Master program in Geospatial Science & Technology

Polytechnic University of Puerto Rico

BEST JOBS IN AMERICA

Money/Payscale.com's list of great careers 2010

Full List

High Pay

Job Growth

Quality of Life

Sectors

Low stress | Security | Flexibility | Future growth | Satisfaction | Benefit to society

Low stress

| Rank | Job title | Best Jobs rank | % who say their job is low stress |
|------|--|----------------|-----------------------------------|
| 1 | Biomedical Engineer | 10 | 70.0 |
| 2 | Transportation Engineer | 51 | 69.0 |
| 3 | Statistician | 64 | 64.0 |
| 4 | Web Developer | 67 | 57.7 |
| 5 | Geographic Information Systems Analyst | 97 | 55.6 |
| 6 | Technical Writer | 88 | 54.9 |
| 7 | Test Software Development | 30 | 54.2 |

Galleries

1 2 3 4

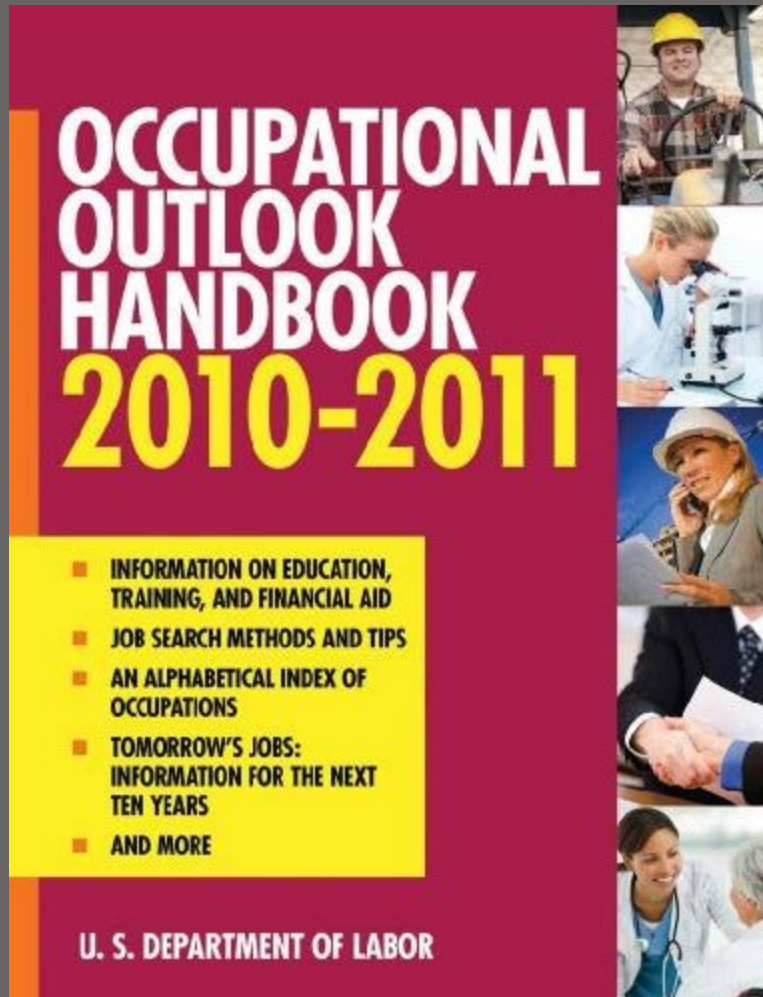


'I have the best job in America'

Meet 10 people lucky enough to have the top careers and see why they love their jobs.

[See them all](#)

Occupational Outlook Handbook, U.S. Department of Labor



Geospatial Information Scientists and Technologists occupation is one of the "new and emerging occupations" with the highest projected growth for the next decade. It is estimated that it will generate about 72,600 jobs across the United States and its territories. Median wages (2010) = \$38.10 hourly, \$79,240 annual

Geospatial Labor Market Projections – U.S. Department of Labor

| Occupation | Employment (2010) | Projected Growth (2010 - 2020) |
|---|-------------------|--------------------------------|
| Geospatial Information Scientists and Technologists | 210,000 | 51,600 |
| Geographic Information Systems Technicians | 210,000 | 51,600 |
| Remote Sensing Scientists and Technologists | 30,000 | 13,300 |
| Remote Sensing Technicians | 62,000 | 33,500 |
| Precision Agriculture Technicians | 62,000 | 33,500 |
| Geodetic Surveyors | 51,000 | 24,200 |
| Surveyors | 51,000 | 24,200 |
| Surveying Technicians | 57,000 | 20,000 |
| Mapping Technicians | 57,000 | 20,000 |
| Cartographers and Photogrammetrists | 14,000 | 6,100 |
| | | |
| TOTAL | 804,000 | 278,000 |

Source: US Department of Labor

WHAT IS A RECOGNIZED PROFESSION?

- “The legitimization of professional authority involves three distinctive claims: first, that the knowledge and competence of the professional have been **validated by a community of his or her peers**; second, that this consensually validated knowledge rests **on rational, scientific grounds**; and third, that the professional’s judgment and advice are oriented toward a set of **substantive values**, such as health. These aspects of legitimacy correspond to the kinds of attributes—collegial, cognitive, and moral—usually embodied in the term “profession.”

P. Starr, The Social Transformation of American Medicine, Basic Books, 1982, p. 15.

CHARACTERISTICS OF A PROFESSION

Pugh (1989)



Gary Ford and Norman Gibbs (1996)



Obermeyer (2007)



Education

Certification
or Licensing

Professional
Society

Code of
Ethics

Prof.
Culture

EDUCATION



~~Geographic Information Systems~~

Geographic Information Science

Goodchild, 1992

Geographic Information Science & Technology Body of Knowledge

Edited by David Edrington, Michael Goodrich, Jan Johnson, Karen Kropf, Ann Taylor Leach, Bradshaw Pinner, and Elizabeth Stone

UNIVERSITY CONSORTIUM FOR GEOGRAPHIC INFORMATION SCIENCE

Analytical Methods

AM1 Academic and analytical origins

- 1.1 Academic traditions
- 1.2 Analytical approaches

AM2 Query operations and query languages

- 2.1 SQL
- 2.2 Relational Query Language (RQL) and other query languages
- 2.3 Spatial queries

AM3 Geometric measures

- 3.1 Distance and angle
- 3.2 Location
- 3.3 Area
- 3.4 Line
- 3.5 Proximity and distance-based adjacency and connectivity

AM4 Basic analytical operations

- 4.1 Buffering
- 4.2 Overlay
- 4.3 Region algebra
- 4.4 Map algebra

AM5 Basic analytical methods

- 5.1 Data pattern analysis
- 5.2 Similarity and spatial relationships
- 5.3 Spatial cluster analysis
- 5.4 Analyzing multi-dimensional datasets
- 5.5 Self-organizing mapping
- 5.6 Self-organizing maps
- 5.7 Spatial process analysis

AM6 Analysis of surfaces

- 6.1 Understanding surface derivatives
- 6.2 Representation of surfaces
- 6.3 Surface features
- 6.4 Topography
- 6.5 Profile surfaces

Conceptual Foundations

CF1 Philosophical foundations

- 1.1 Ontology and epistemology
- 1.2 Epistemology
- 1.3 Ontological perspectives

CF2 Cognitive and social foundations

- 2.1 Perceptual and cognitive foundations
- 2.2 From cartography to GIS
- 2.3 Geography as a discipline for GIS
- 2.4 Research techniques
- 2.5 Interdisciplinary approaches
- 2.6 Social influences
- 2.7 Political influences

CF3 Domains of geographic information

- 3.1 Space
- 3.2 Time
- 3.3 Interdisciplinary domains: space and time
- 3.4 Integration

AM7 Spatial statistics

- 7.1 Spatial models
- 7.2 Statistical processes
- 7.3 The spatial weights matrix
- 7.4 Global measures of spatial association
- 7.5 Local measures of spatial association
- 7.6 Indices
- 7.7 Systemic methods

AM8 Geostatistics

- 8.1 Spatial modeling for statistical analysis
- 8.2 Kriging of continuous variables
- 8.3 Semi-variogram modeling
- 8.4 Principles of kriging
- 8.5 Kriging methods

AM9 Spatial regression and autocorrelation

- 9.1 Principles of spatial econometrics
- 9.2 Spatial econometric models
- 9.3 Spatial filtering
- 9.4 Spatial autocorrelation and spatially explicit regression models (SEM)

AM10 Data Mining

- 10.1 Definition of large spatial datasets
- 10.2 Data-mining approaches
- 10.3 Knowledge Discovery
- 10.4 Pattern recognition and modeling

AM11 Network analysis

- 11.1 Network models
- 11.2 Single-criteria, deterministic measures
- 11.3 Network algorithms
- 11.4 Flow modeling
- 11.5 The Traveling Salesman Problem
- 11.6 Other classic network problems
- 11.7 Accessibility modeling

AM12 Optimization and location-allocation modeling

- 12.1 Optimal network modeling and location-allocation modeling
- 12.2 Linear programming
- 12.3 Integer programming
- 12.4 Location-allocation modeling and

CF4 Elements of geographic information

- 4.1 Location
- 4.2 Time and processes
- 4.3 Fields in space and time
- 4.4 Integrated models

CF5 Relationships

- 5.1 Integration
- 5.2 Hierarchical, diagonal relationships
- 5.3 Hierarchical, non-diagonal, diagonal relationships
- 5.4 Triangular relationships
- 5.5 Addition, multiplication, subtraction and division
- 5.6 Spatial distributions
- 5.7 Layers
- 5.8 Spatial integration

CF6 Implications to geographic information

- 6.1 Integration
- 6.2 Mathematical models of regression
- 6.3 Field models and regression
- 6.4 Hierarchical analysis
- 6.5 Mathematical models of uncertainty
- 6.6 Probability and statistics

Cartography and Visualization

CV1 History and trends

- 1.1 History of cartography
- 1.2 Technological developments

CV2 Data visualization

- 2.1 Visual encoding for mapping
- 2.2 Visualization: classification, scale, and generalization
- 2.3 Topographic and map design rules

CV3 Principles of map design

- 3.1 Map design fundamentals
- 3.2 Basic principles of cartographic design
- 3.3 Color for cartography and visualization
- 3.4 Designing for cartography and visualization

CV4 Graphic representation techniques

- 4.1 Basic cartographic mapping methods
- 4.2 Multivariate mapping
- 4.3 Symbols and interaction techniques
- 4.4 Generalizing symbols
- 4.5 Web mapping and visualization
- 4.6 Visual and interactive environments
- 4.7 Interactivity
- 4.8 Visualization of temporal geographic data
- 4.9 Visualization of uncertainty

CV5 Map production

- 5.1 Cartographic design
- 5.2 Map production
- 5.3 Map reproduction

CV6 Map use and evaluation

- 6.1 The use of maps
- 6.2 Map reading
- 6.3 Map interpretation
- 6.4 Map analysis
- 6.5 Evaluation and testing
- 6.6 Impact of usability

Design Aspects

DA1 The scope of GIS/T systems design

- 1.1 Using scientific research information and processes
- 1.2 Requirements of various data, attributes, and processes
- 1.3 The scope of GIS/T applications
- 1.4 The scope of GIS/T design
- 1.5 The process of GIS/T design

DA2 Project definition

- 2.1 Project definition
- 2.2 Planning for design
- 2.3 Architecture/team assessment
- 2.4 Requirements analysis
- 2.5 Initial position, with selected users

DA3 Resource planning

- 3.1 Feasibility analysis
- 3.2 Software analysis
- 3.3 Data analysis
- 3.4 Staff and management
- 3.5 Capital, facilities and equipment
- 3.6 Funding

DA4 Database design

- 4.1 Modeling needs
- 4.2 Conceptual model
- 4.3 Logical models
- 4.4 Physical models

DA5 Analysis design

- 5.1 Recognizing analytical requirements
- 5.2 Identifying and designing analytical processes
- 5.3 Mapping scientific needs onto GIS
- 5.4 Establishing a prioritized design

DA6 Application design

- 6.1 Workflow and process design
- 6.2 User interface
- 6.3 Designing user interfaces for geographic applications
- 6.4 Computer-based Software Engineering (CASE) tools

DA7 System implementation

- 7.1 Design implementation
- 7.2 Design implementation
- 7.3 System testing
- 7.4 System deployment

Data Modeling

DM1 Basic storage and retrieval structures

- 1.1 Data file structures
- 1.2 Data relational structures

DM2 Database management systems

- 2.1 Core models of GIS/T and GIS
- 2.2 Relational GIS/T
- 2.3 Spatial models (GIS/T)
- 2.4 Relational vs. the relational model

DM3 Vector data models

- 3.1 Representations
- 3.2 The vector model
- 3.3 Data relationships in models
- 3.4 The polygon model
- 3.5 The Triangulated Irregular Network (TIN) model
- 3.6 Features
- 3.7 Hierarchical data models

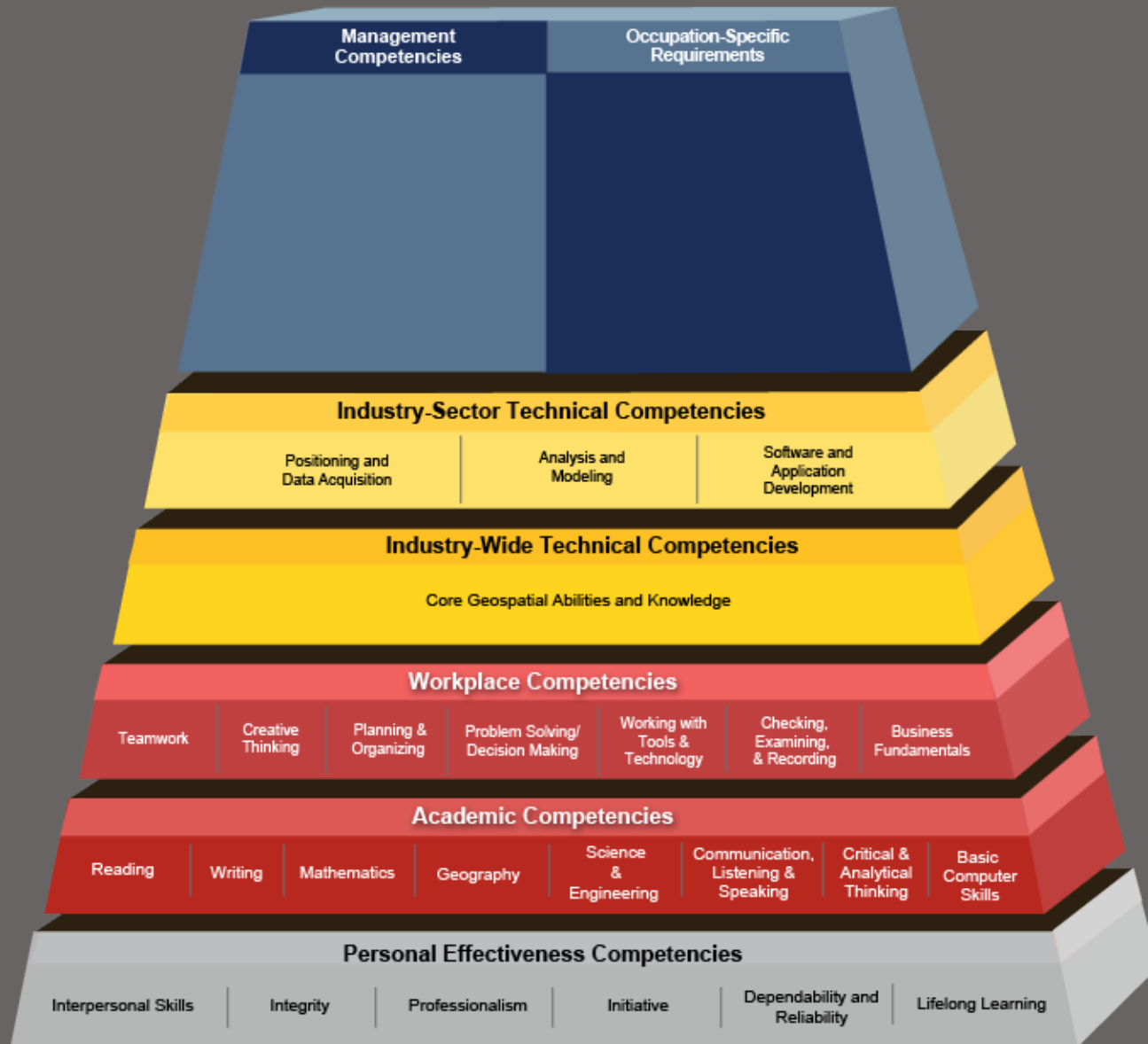
DM4 Vector and object data models

- 4.1 Object-oriented models
- 4.2 The object model
- 4.3 Data relationships in models
- 4.4 The network model
- 4.5 Data relationships
- 4.6 Hierarchical spatial databases

DM5 Modeling 2D, uncertain, and temporal phenomena

- 5.1 Spatial modeling (GIS)
- 5.2 Modeling uncertainty
- 5.3 Modeling time-dimensional entities

Competency Model – Dept. of Labor





The Geospatial Management Competency Model
February 20, 2012



CERTIFICATION OR LICENSING



CODE OF ETHICS



GIS Certification Institute

[▶ HOME](#)[▶ FEEDBACK](#)[▶ CONTENTS](#)[▶ SEARCH](#)

TEL: 847-824-7768

[EMAIL](#)[Applicants ▶](#)[GISPs ▶](#)[Employers ▶](#)[Students / Practitioners ▶](#)[Ethics and Conduct ▶](#)[Newsroom ▶](#)[Organizations / Events ▶](#)[Organizational News ▶](#)[About / Contact GISCI ▶](#)

A GIS Code of Ethics [\[i\]](#)

[Rules of Conduct](#)

(The Rules of Conduct is a set of implementing laws of professional practice that seek to express the primary examples of ethical behavior consistent with the Code of Ethics.)

[Report an Ethics Violation](#)

(Report unethical behavior of a GISP)

[Code of Ethics](#) (Printer Ready Format)

This Code of Ethics is intended to provide guidelines for GIS (geographic information system) professionals. It should help professionals make appropriate and ethical choices. It should provide a basis for evaluating their work from an ethical point of view. By heeding this code, GIS professionals will help to preserve and enhance public trust in the discipline.

This code is based on the ethical principle of always treating others with respect and never merely as means to an end: i.e., *deontology*. It requires us to consider the impact of our actions on other persons and to modify our actions to reflect the respect and concern we have for them. It emphasizes our obligations to other persons, to our colleagues and the profession, to our employers, and to society as a whole. Those obligations provide the organizing structure for these guidelines.

GIS Ethics - Products



OSU Oregon State University



UNIVERSITY OF MINNESOTA



Ethics Education for Geospatial Professionals

gisprofessionalethics.org

PROFESSIONAL CULTURE



PERCEPCION REMOTA Y SISTEMAS DE INFORMACION GEOGRAFICA DE PUERTO RICO

PRYSIG | Objetivos | Conferencias | Seminarios | Enlaces Relacionados | Contáctenos

Introducción

Programa

Conferenciantes

Taller

Pre-Registro

Mapa para llegar

Auspiciado por:

10^{ma} Reunión de PRYSIG

7 de septiembre de 2012

Sala Tarzán del Centro de Estudiantes

UPR-Recinto Universitario de Mayagüez

En el verano del 2003 el Centro Hemisférico de Cooperación en Investigación y Educación en Ingeniería y Ciencia Aplicada (CoHemis) de la Universidad de Puerto Rico en Mayagüez (UPRM) reunió por primera vez un pequeño grupo de especialistas trabajando en Puerto Rico con percepción remota y sistemas de información

Décima reunión nacional de
Percepción Remota y Sistemas
de Información Geográfica de
Puerto Rico

"Una década uniendo a Puerto Rico desde el espacio"



PROFESSIONAL SOCIETY



APROSIG

| | Nonexistence | Development | Growth | Maturity |
|---------------------|--|-------------|--------|----------|
| Education |  | | | |
| Certification |  | | | |
| Ethics |  | | | |
| Culture |  | | | |
| Profesional Society |  | | | |

What Needs to be done.

- Professional society
- Standardize Education
- Certification

- Ford , G. and Gibbs, N. E. (1996) A Mature Profession of Software Engineering, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, Pa., tech. report CMU/SEI-96-TR-004.
- Goodchild,M.F. (1992) Geographical information science. International Journal of Geographical Information Systems 6(1): 31–45.
- Obermeyer, N. (2007) GIS: The Maturation of a Profession. Cartography and Geographic Information Science, Vol. 34, Num, 2.
- Pugh, D. L. (1989). Professionalism in Public Administration: Problems , perspectives and the role of ASPA. Public Administration Review. 49: 1-8.