

Master of Science in Information Design and Visualization

New Degree Proposal

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Summary

The Department of Art + Design proposes an interdisciplinary Master of Science program that focuses on the analytical and visual communication of information. We intend to graduate professionals in data visualization who are well-versed in the scientific and methodological principles of data visualization and apply them to produce meaningful visual communication in interdisciplinary collaborations. Our graduates will be well positioned to excel as data visualization specialists, human-computer interaction researchers, communication designers, and visual strategists. Besides acquiring professional qualifications, graduates will also be well-positioned to continue their education in PhD programs in Information Visualization, Human Computer Interaction (HCI) and other related fields.

The Master of Science program draws from the course offerings of the established Master of Fine Arts in Information Design and Visualization program and includes additional research-oriented courses. The MS-IDDV positions our graduate visualization offerings to 1) be more attractive to students who are interested in the quantitative and analytical aspects of data visualization and want to acquire a STEM degree; and 2) provides advanced undergraduate students who fulfill certain prerequisites with a route towards an accelerated master degree (PlusOne option). The program will create synergies with our established IDV program and the IDV certificate, which will allow us to extend the elective course offerings in this field.

Program Description

Since 2013, CAMD has offered the full-time graduate MFA program in Information Design and Visualization. With a current student body of ca. 25 full-time graduate students, the program has so far graduated around 50 students with an MFA degree. The program capitalizes on the dramatic changes as we have gained access to growing quantities of data, increased networked connectivity and computational modes of analysis. Since 2016, the MFA has been complemented by a graduate certificate program for practitioners and graduate students in relevant fields of design, communication and media studies, data science, business and health. We think that offering a Master of Science in Information Design and Visualization is timely with respect to recent developments in the field. Until not too long ago, visualization has been regarded as a discipline for specialists dealing with problems of limited scope. During the past five years, the environment has changed: interactive data visualization now plays an increasingly important role in the professional world.

The “data revolution” has affected all aspects of society, and information visualization is the native language for communicating and exploring data-related issues. As data- and analytics related services become increasingly central to their activities, large companies increasingly hire data visualization and human-computer interaction experts and establish information design departments. This is especially the case for blue-chip companies and the health- and education sectors. Also, the public sector such as city and local governments have become increasingly data driven, such as establishing open-data portals that respond to citizen requests for information, provide startups with public data services, and develop civic interfaces for interacting and communicating with constituents. NGOs and organizations of the civic society increasingly rely on the persuasiveness of data visualization for advocacy and education. Finally, many academic and commercial research institutions have shown an increasing demand for information visualization experts for internal and external communication of their research. Alumni from the MFA-IDV program are currently working in all of these areas. While we see a sustained demand for dedicated data visualization experts, we also see an increasing need for professionals and domain experts with strong technical and quantitative skills.

The Master of Science will offer applicants with a background in technical foundations and visual design the necessary design and research skills to enable effective visual communication and build state of the art data visualizations. The program will also provide the theoretical context and the empirical methods necessary for conducting experiments to evaluate the effectiveness of interactive data visualizations.

Program Format

The MS in Information Design and Visualization is designed to address these opportunities by offering competencies needed by professionals moving to the forefront of design and communication practices in the workplace and the marketplace. The program is conceptualized as a one-year, professional graduate degree with 32 credit hours.

Contribution to College and University Mission

The Information Design and Visualization Master of Science Program supports the University’s humanics mission by educating students who will be adept at working across creative and technical disciplines in the visual communication of information critical to local and global decision-making on a multitude of socially relevant issues. The skillful visualization of information in order to relay complex content to wider audiences is directly aligned with the Health, Security and Sustainability research foci of the University. The curriculum reaches out to other departments and programs in the University to best identify relevant research questions and address significant cross-disciplinary issues.

Clientele Analysis and Evidence of Demand

The Master program is unique in its synergies with the MFA program in Information Design and Visualization, paying equal attention to design and research-related aspects of visualization. While there is no direct competing program within the university, the proposed graduate program is complementary to the suite of data analytics certificate programs offered in collaboration between the College of Computer and Information Sciences and the College of Social Sciences and Humanities.¹

While several universities offer Master programs of a comparable scope, the strength of our proposed program is its embedding in the suite of related graduate programs including the MFA in information design and experience design.

- Parson’s School of Design offers a 30 credit, STEM-designated MS program in Data Visualization with a comparable curriculum.² The curriculum includes two studio courses, an introduction to “Data Visualization and Information Aesthetics”, two research methods courses, a theory course, and an elective.
- Pratt Institute offers an MS in Data Analytics and Visualization (STEM).³ The 36-credit program offers foundational 3-credit courses in information visualization, quantitative methods, Usability Theory & Practice, and programming and a large number of electives.
- The University of Washington in Seattle offers a Master of Human-Computer Interaction and Design (STEM).⁴ The strongly design oriented curriculum includes research methods, a usability course, a programming course, and a large number of design studios.
- The CUNY graduate center offers a 30-credit Master’s degree in Data Analysis and Visualization.⁵ The compared to the other programs, this program offers a stronger concentration in media theory and history.
- Northwestern University offers an online Master's in Information Design & Strategy.⁶ The degree requires the completion of 12 courses in one of four different specializations including Content Strategy, Data Science and Analytics, Learning Design, and Interdisciplinary Studies.

Impact on Existing Programs at Northeastern

The Master of Science in Information Design and Visualization builds upon the existing curriculum and course offerings of the Information Design and Visualization MFA. The MS-IDDV positions our graduate visualization offerings to 1) be more attractive to students who are interested in the quantitative and analytical aspects of data visualization and want to acquire a STEM degree; and 2) provide advanced undergraduate students who fulfill certain prerequisites

¹ For further information, see: <http://www.northeastern.edu/data-analytics/data-science-certificate>

² See <https://www.newschool.edu/m/data-visualization/> and <https://www.newschool.edu/parsons/ms-data-visualization/?show=program-curriculum>

³ See <https://www.pratt.edu/academics/information/degrees/data-analytics-and-visualization-ms>

⁴ See <https://mhcid.washington.edu>

⁵ See <https://www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Masters-Programs/Data-Analysis-and-Visualization>

⁶ See <https://sps.northwestern.edu/masters/information-design/program-courses.php>

with a route towards an accelerated master degree (PlusOne option). The program will create synergies with our established IDV program and the IDV certificate, which will allow us to extend the elective course offerings in this field.

PlusOne Accelerated Master initiative (4+1)

Under Northeastern's initiative, "up to 16 credits earned count toward a bachelor's and master's degree, allowing students to receive their graduate degree one year sooner than they would in a traditional master's program."⁷ Accordingly, Northeastern undergraduates in the Art+Design program can take up to four graduate courses from the following list as part of their undergraduate education and earn up to 16 credits for the MS:

- ARTG 5130 Visual Communication for Information Design⁸
- ARTG 5150 Information Visualization Principles and Practices
- ARTG 5151 Design Critique Seminar
- ARTG 5310 Visual Cognition
- ARTG 5320 Introduction to Statistics and Data Analysis
- ARTG 5330 Visualization Technologies

Northeastern undergraduate students joining the accelerated master from a design major discipline can waive the first semester course *ARTG 5100 Information Design Studio 1* and replace it with an elective.

Northeastern undergraduate students joining the accelerated master from a non-design major discipline have to take the course *ARTG 5130 Visual Communication for Information Design* as a prerequisite, which will count as an elective towards the MS degree.

Costs, Resources, and Revenue

The MS program will grow from existing resources within the course offerings, faculty and space use of the Art + Design department and specifically the MFA in Information Design and Visualization program. As such, no new or additional resources would be needed. Students will benefit from the resources offered by the MFA program such as attending guest lectures; and at the same time, the MS will allow us to expand these resources.

Program Learning Outcomes

Students will gain the skills to design and implement visual and interactive information displays that clarify complex matters, explain processes, reveal insights, elucidate concepts and relate stories. The program will guide them how to:

⁷ See <https://www.northeastern.edu/graduate/why-northeastern/graduate-academic-options/plusone-accelerated-masters>

⁸ For non-design majors

- Articulate knowledge of the design principles, theories, and technologies of Information Design and Visualization.
- Represent information in visual languages that take advantage of the properties of human perception and cognitive capabilities, accurately represent the underlying data structures, and support the desired tasks to be accomplished by the user.
- Demonstrate facility with developing and investigating research questions through qualitative and quantitative methods in all stages of data collection, transformation, and analysis that accompany the production and evaluation of data visualizations.
- Use emerging technologies and visualization techniques to explore and reveal meaningful patterns in large data sources.
- Compare, evaluate, and critique information design artifacts based on the ethics, history, and cultures of visual communication.
- Critically reflect on the role of data and abstract information in practices of knowledge production and society, and articulate arguments informed by the contemporary scholarly discourse and its relevant theoretical and critical positions.

STEM Designation

Experts in Information Visualization and Data Analytics are in high demand across industry, and the MS degree speaks to the rising call for information designers with strong quantitative research skills and technical competencies. Therefore the MS program is conceptualized as a STEM degree under the following CIP code:

30.3101 - Title: Human Computer Interaction⁹

Definition: An interdisciplinary program that focuses on the study of the interaction between people and technology and how that technology impacts society, and combines disciplines within the fields of computing and information science (information systems, software engineering, artificial intelligence and design) and the behavior sciences (cognitive science, cognitive psychology, sociology, organizational psychology, and social psychology). Includes instruction in information technology, cognitive and behavioral sciences, and systems design.

This CIP code applies here because the disciplines of Information Design and Visualization, or information visualization in short, is considered part of the human-computer interaction (HCI) field. While human-computer interaction deals with the interaction between humans and machines in general, information design and visualization focuses on the visual interfaces that enable this interaction. The design of these interfaces requires knowledge of information theory, visual perception and cognition, visual languages, data structures and algorithms. Building such interfaces requires robust programming skills and knowledge of computer graphics and web technologies.

Admission Criteria

Application requirements include:

⁹ See <https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=89253>

- Completed application
- Application fee
- Personal statement
- 3 letters of recommendation
- Official transcripts

International applicants must provide proof of English proficiency (minimum TOEFL score of 90 on the internet-based exam [equivalent to 550 on the paper-based exam and 213 on the computer-based exam]). The CAMD Graduate School considers an undergraduate GPA of 3.000 or better to be favorable.

An admissions committee will evaluate students on a rolling basis to assess their experience and objectives with the goal of welcoming diverse perspectives to pursue the certificate.

Curriculum

| MS Information Design and Visualization Requirements | | |
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| Course | Credits | Comments |
| Term 1 | | |
| ARTG 5150 Information Visualization Principles and Practices (3 SH) ARTG 5151 Design Critique Module (1 SH) | 4 semester credits | First offered spring 2019 |
| ARTG 5330 - Visualization Technologies 1 | 4 semester credits | Currently offered every semester |
| ARTG 5100 Information Design Studio 1 | 4 semester credits | Currently offered every fall |
| ARTG 5310 Visual Cognition | 4 semester credits | Currently offered as elective |
| Term 2 | | |
| ARTG 5320 Introduction to Statistics and Data Analysis | 4 semester credits | Currently offered as elective as “Statistics basics for Designers” |
| ARTG 6110 Information Design Theory and Critical Thinking | 4 semester credits | Currently offered every spring |
| ARTG 6100 Information Design Studio 2 | 4 semester credits | Currently offered every spring |
| Information Design Elective | 4 semester credits | Choose from the list below |

Course Descriptions

ARTG 5150 – Information Visualization Principles and Practices (3 SH)

Introduces information visualization from theoretical and practical perspectives. Defines the information visualization domain and advances principles and methods for the effective visual representation of data. Contextualizes the field from a historical perspective. Presents the perceptual and cognitive tasks enabled by visualizations. Studies an extensive range of visualization models. Illustrates good and bad practices in visualization with real-world examples. Introduces concepts in computer programming in an information visualization context.

ARTG 5151 – Design Critique Seminar (1 SH)

In conjunction with course ARTG 5150, this course requires students to present their work in bi-weekly design critique sessions to peers, faculty and guests. Through these critiques, students have the opportunity to improve their projects based on feedback, learn how to present their work effectively, and articulate design problems in verbal discourse.

ARTG 5330 – Visualization Technologies 1 (4 SH)

Introduces programming languages that allow computational analysis and digital delivery of dynamic information. Examines characteristics and implications of different data sources, including environmental and personal sensor data sources, real-time and historical data, and social use of shared data visualization tools.

ARTG 5100 – Information Design Studio 1 — Principles (4 SH)

Explores the theories and practices of information design through studio projects. Investigates visual systems and information structures such as maps, timelines, charts, and diagrams. Emphasizes the creative process of organizing, visualizing, and communicating data by seeking to make complex information easier to understand and use.

ARTG 5310 – Visual Cognition (4 SH)

Introduces human visual cognition as it applies to information design and visualization. Focuses on perception, attention, pattern recognition, information acquisition, memory, and creation of mental models. Explores reasoning, cognition, decision making, and problem solving in relation to visual artifacts.

ARTG 5320 Introduction to Statistics and Data Analysis (4 SH)

Introduces foundational skills to collect, summarize, analyze, and interpret data for the beginner data literate. Introduces concepts and methods in statistical reasoning and analysis. Topics include data mining, comparison, assessment, and delivery. Students who do not meet course restrictions may seek permission of instructor or program coordinator.

ATG 6100 – Information Design Studio 2 — Dynamic Mapping and Models (4 SH)

Continues the exploration of data representations in a variety of media. Focuses on interactive and time-based techniques. Emphasizes computational methods of data collection, manipulation, and encoding.

ARTG 6110 Information Design Theory and Critical Thinking (4 SH)

Examines various theoretical models of information visualization and delivery systems. Evaluates the concepts and effectiveness of the models through discussions and writing activities. Students who do not meet course prerequisites or restrictions may seek permission of program coordinator or instructor.

Electives:

ARTG 5120 – Research Methods for Design (4 SH)

Examines qualitative and quantitative research methods pertinent to design. Through discussion and writing activities, offers students an opportunity to investigate varied inquiry toward the development of researchable questions, argument formation, and assessment methodologies.

ARTG 5110 – Information Design History (4 SH)

Investigates the history of visualization practices across disciplines and in relation to technology developments. Critically examines seminal visualizations in social, cultural, and technological contexts by means of discussions and writing activities in a seminar format.

ARTG 5130 – Visual Communication for Information Design (4 SH)

Explores graphic and typographic theory, principles, and practices. Introduces students to visual communication design with a primary focus on typography as the fundamental means of conveying content. Readings locate design and typography within the larger history of visual art and writing development. Covers methods of organizing content through hierarchy and spatial organization of grid structures. Considers relationships between positive and negative space, depth perception, transparency, and color theory.

ARTG 6310 – Design for Behavior and Experience (4 SH)

Examines the potential of interfaces as mediators between information and users. Explores iterative prototyping and research methods to analyze patterns of behavior and implications of interface on effective communication. Utilizes observation, empathy, ethnography, and participatory design methods to offer students an opportunity to increase their understanding of audiences' and stakeholders' motivations and expectations.

ARTG 6320 – Design of Information-Rich Environments (4 SH)

Explores methods of information organization, presentation, and navigation in physical space. Introduces concepts of wayshowing and embodiment and examines the bridging of physical and virtual spaces through the use of mobile and locative technologies. Encourages collaborative studio projects exploring interventions in public or urban environments and in exhibit-based learning environments.

ARTG 6330 – Information Design Mapping Strategies (4 SH)

Examines the relationships between content and context through mapping methods. Emphasizes the impact of geographic information systems, evolving technologies, community mapping tools, globalization, and delivery systems.