



Summary

Fordham University: Computer Science Professor

Philips Research: • 14 years Healthcare • 9 years Internet and Consumer devices
 • 12 years Robotics & Automation • Launched 5 products
 • Business and management experience • 45 Patents

EXPERIENCE

Fordham University, Professor/ Full-time Senior Lecturer (2023)

Sept 2017-Present

Computer Science I and II (C++), Computer Organization (electronics, assembly language), Honors STEM I. Computer Science Dept student advisor.

Novel Reach, Chief Technical Officer

Jan 2016-June 2017

Inventor of high resolution 6D planning technology, material manufacturing and logistics to build Nested Cannulas. Nested Cannulas were invented to reach and treat lung cancer from within – without surgery.

Philips Research, Briarcliff Manor, New York, Principal Member of Research staff

Healthcare

Clinical Imaging Data Analytics, Project Leader

2013- 2015

Analyzed database of 1.6 million radiology reports from a major hospital system: Natural Language Processing to extract recommendations, detect quality issues; machine learning to classify matched follow-up exams.

Interventional Guidance

2005-2013

Computer Assisted Interventional Tools (CAIT), Project Leader

2007- 2013

- Developed A* based bronchial segmentation, which was used as a roadmap with fast, high-resolution, 6D non-holonomic planner to automatically design personalized minimally invasive Nested Cannula devices to reach far into the lung & brain. NIH R21 Grant Application. Under discussion for licensing to 3rd party.
- Developed plan and simulation for automatically controlled bronchoscope that is also applicable to controlling catheters and beveled needles.

Radio-Frequency Ablation Planning, Project Leader

2006

Developed fast 3D RF-ablation planning algorithm for covering large tumors, an NP-complete problem. Acquired new customer, PROS, and transferred algorithm to their Pinnacle platform.

Electronic Pill, Project Leader

2005

Initiated product concept in 2003. Pitched to corporate Research Director in 2004, obtaining funding for the technical and business team. Filed 9 patent applications. iPill became a LabVenture. My published patent application drew attention, causing publicity in the NY Times, CNN, and other publications. With venture funding, the MediMetrics business launched in 2011.

- Generated business case for new multi-modality breast imaging system called X-WhoBUS. Quantified the business opportunity for Philips, imaging centers, and insurance payors. Assessed the impact of consumerism on the medical businesses.
- Coordinated a team with expertise in business development, user-centered product design, and technology to identify products that are technically novel, desirable by users, profitable, and fall within the global brand strategy. As liaison to Corporate Branding, reshaped research technologies toward consumer applications and tracked them through a market assessment process.

Project Leader: Guided Ultrasound**2001 - 2002**

Developed an automated system of multiple pipelined processes to remotely control an HDI5000 ultrasound system. This real-time system automatically analyzed ultrasound images to direct the motion of a novice user. Coached the Consumer Ultrasound project leader by structuring business support to elaborate and prioritize new, ultrasound-based product concepts.

Internet and Consumer devices**2000 – June 2001****Project Leader: Internet-Enabled Applications for Personal Home Devices.****1999-2001**

Invented SmartSurfer, an easy to use ‘surf by category’ (news, sports, etc.) TV program guide. After a powerful consumer screening response, led a team to build a working prototype. Negotiated the contract with Tribune Media Services for daily updates of their Electronic Program Guide data. Within 9 months of the start, this feature was accepted and transferred to Philips Consumer Electronics for the 2000 Philips-DirecTV set-top user interface.

Lead Developer for Handheld based TV program guide viewer/smart-tuner with selective EPG program download from a web server. Nearly 2 million Philips DirectTV receivers have been sold with the SmartSurfer feature. (Direct TV SmartSurfer Feature Link)

Project Leader: Geographic Information Systems (GIS)**1993-1997**

Goal: To leverage Philips’ investment in Navigation Technologies (Navtech), the leading electronic map database company, by defining new business opportunities.

Hired and led GIS development staff to produce three products, and prototype & improve 2 others:

- Launched “MetroNavigator” consumer software CD. Initiated, presented the business case and championed through to production. Launched through Philips Media, May 1996. Rated one of Top 25 Products of Year by Family PC magazine.
- www.metronavigator.com launched in May 1996. Dynamic, personalized driving directions. Precursor to mapquest.com.
- Philips Home Services Screen-Phone e-business. Client-server based driving directions service, July 1996.
- Car Systems: Improved in-car navigation algorithms for the BMW CARiN system using real-time traffic information.
- FaxMap: Led a team that focused on telephone-based businesses and built a fax-back directions system.

Traffic Monitoring and Analysis: Designed a system to collect real-time traffic flow data that has minimum communication overhead and low installation cost.

Generic Motion Controller (GMC) Project: Provided software models to automatically control multi-jointed machines (robot arms). Built a Kinematic Description Language (KDL) based on YACC and Lex. KDL allows the designer to describe the interconnection of links and joints of robotic and NC type devices to form the kinematic model of the machine. The model is tied to a kinematics package to automatically generate control code in 'C' for MCV-60 motion controller cards or alternatively, drive a graphical simulation of the machine.

Collision avoidance system for a Transmission Electron Microscope (TEM): Designed a system to ensure collision avoidance and joint limit protection for safe operation of machines. Built a precise Pro/Engineer model of the TEM to verify 3-D swept regions for collisions.

Artificial Intelligence for Path Planning Research: This technology enables machinery (or animations) to behave autonomously and cooperatively as autonomous, optimizing agents. Invented path planning techniques to enable autonomous mechanisms to perform goal-directed, collision-free intelligent motions based on sensory input, while learning and responding to new environments. Example domains:

- road navigation, which uses the same methods in current driving directions
- intelligent emergency exits for buildings, using existing fire sensors and directional lights
- robot control, and
- automatic car parking, where a small team built a driving system for a model car, integrating a real-time vision system, controller, and planner on a multi-processors with a Sun UI.

Automated Instrumentation Department**1980-1986**

Responsible for specification, design, and implementation of LABICS (LABoratory Instrumentation Control System). This real-time system is designed to control several X-ray analytic instruments simultaneously, each consisting of many measuring, positioning, and sensing devices each. Interpreter and control written in 'C'.

Advanced Languages Department**1979-1980**

Wrote the math and graphics libraries for PL-Modula compiler.

Adjunct Professor of Computer Science, Pace University, White Plains, New York**1989-1991**

CS502 - Introduction to Computer Science, Fall 1989.

CS501 - Introduction to Computing, Fall 1991.

CS601 - Computer Algorithms, Spring 1990.

Graduate seminars 1991, 1992, 1995.

Invited Lectures: Rensselaer Polytechnic Institute, Case Western Reserve, Rutgers University, Mercy College

Education and Licenses:

Ph.D. Computer Science, University of Amsterdam. Thesis: "A* Planning in Discrete Configuration Spaces of Autonomous Systems." 1996. <https://staff.fnwi.uva.nl/l.dorst/inventor/TrovatoThesis1996.pdf>

U.S. Patent Agent #36,365. Passed the Patent Bar Exam 4/92. Able to write and prosecute patent applications before the U.S. Patent and Trademark Office. Information Sciences liaison to Philips Patent Department. Patent Review Chair.

M.S. Computer Science, New York University, 1982. GPA (3.7/4.0)

Course work included: Robotics, Graphics Applications, Statistics, Compiler Design, Computer Architecture, VLSI Design, and courses and semester project in mathematical modeling.

B.S. Computer Science/Applied Math & Statistics, State University of New York at Stony Brook, 1979.

Corporate Education:

"Java Programming", Learning Tree, 1998

"Select Management Program", 1996.

"Collaboration Skills", Philips Electronics course, 1995.

"Programming in Microsoft C++", Microsoft University, 1995.

"Marketing Planning Program", Columbia Prof. Hulbert, 1993.

"Object Oriented Analysis and Design", Learning Tree, 1997

"Project Leadership", project planning, ICS Group, 1995.

"Finance for Decision Making", Villanova Prof. Monahan, 1994.

"Sales Presentation Skills", Philips Electronics course, 1992.

Key awards and honors:

State University of New York, Honorary Doctorate.

2022

Keynote speaker at Dutchess Community College graduation. May 19, 2022

2017 Eleanor Roosevelt Val-Kill Medalist October 15, 2017

2017

<https://www.poughkeepsiejournal.com/picture-gallery/news/2017/10/15/photos-2017-eleanor-roosevelt-val-kill-medal-ceremony/106691012/>

Inventor of the Year, 2005. New York Intellectual Property Law Association.

2005

<https://www.nyipla.org/nyipla/InventoroftheYearAward.asp>

<http://staff.science.uva.nl/~leo/inventor/>

Extraordinary Product Development Award

1995

This is Philips Research's highest award. Received for developing and launching MetroNavigator, the world's first web-based driving directions service as well as the CD product.

Technology outreach / college support:

1) Fordham advisor "Girls Who Code". Newly started Sept 2019-present. Now fully recognized.

2) American Association of University Women, Westchester, STEM activities:

- Girls for STEM- Explore Your Opportunities, Conference for 6-7th grade girls. Hands on science program and 'meet women in technology'. Held at College of Mt. St. Vincent.

<http://westchester-ny.aauw.net/activities/explore-your-opportunities/>

Annual event 2008-present.

- WizGirls: 6-7th Graders. Teach 'One Hour of Code' . since 2016
- StartSmart. Pay negotiation program for women.

3) Dutchess Community College Alumni of the Year 2017 – and inventor advocate

While being honored as an inventor myself, I met Dana Jones. She had a need and a vision for automated door opening for the wheelchair bound. I shared my knowledge of patents and initial feasibility assessment. She went on to found Accessadoor.

<https://www.marist.edu/-/marist-news-an-entrepreneur-for-accessibility-dana-jones-20-#.Y8HpmGTT0UU.link>

4) National Alumni of the Year. American Association of Community Colleges. New Orleans, May, 2017.

<http://www.prnewswire.com/news-releases/outstanding-community-college-alumni-to-be-honored-by-national-association-300442154.html> <https://aaccbox.aacc.nche.edu/fl/tOvYbPFvQy#folder-link/>

<https://www.aacc.nche.edu/about-us/awards/outstanding-alumni-awards/2017-outstanding-alumni/>

<https://www.youtube.com/watch?v=SeCJzMVYsNQ>

5) NSF-AACC Community College Innovation Challenge, Judge. Washington, DC, June 2017.

Patents and Publications:

----- Issued U.S. Patents -----

- 1) U.S. Patent Serial # 10,653,320. *Volume mapping using optical shape sensors*. K. Trovato, R. Chan, R. Manzke, C. Kung, B. Ramachandran, L. Verard. Issued: May 19, 2020.
- 2) U.S. Patent Serial # 10,254,109. *Sound Controller for Optical Shape Sensor*. K. Trovato, W Sgambati, M. Flexman, B. Ramachandran. Issued: April 9, 2019.
- 3) U.S. Patent Serial # 9,946,979. *Method and system for fast precise path planning*. K. Trovato and A.Popovic. Issued: April 17, 2018.
- 4) U.S. Patent Serial # 9,895,163. *Active cannula configuration for minimally invasive surgery*. K. Trovato. Issued: February 20, 2018.
- 5) U.S. Patent Serial # 9,747,684. *RF ablation planner*. K. Trovato and Douglas Summers-Stay. Issued: August 29, 2017.
- 6) U.S. Patent Serial # 9,649,461. *Nested cannula starter alignment*. C. Kung and K. Trovato. Issued: May 16, 2017.
- 7) U.S. Patent Serial # 9,593,943. *Clamp mechanism for clamping an optical shape sensing fiber*. B. Ramachandran; M. Van Der Mark; B. Martinus, K. Trovato, C. Van Der Vleutens, D. Noonan, M. Flexman, J. Horikx, A.H. Van Dusschoten, E.G. Van Putten. Issued: March 14, 2017.
- 8) U.S. Patent Serial # 9,417,104. *Electronic gastrointestinal screening*. J. Shimizu; Jeff, K. Trovato. August 16, 2016
- 9) U.S. Patent Serial # 9,387,047. *Interstitial lung access using nested cannulas*. K. Trovato. Issued: July 12, 2016
- 10) U.S. Patent Serial # 9,327,076. *Electronically and remotely controlled pill and system for delivering at least one medicament*. K. Trovato, G. Spekowius. Issued: May 3, 2016
- 11) U.S. Patent Serial # 8,597,278. *Medicament delivery system and process*. K. Trovato and J.Shimizu. Issued: December 3, 2013
- 12) U.S. Patent Serial # 8,578,439. *Method and apparatus for presentation of intelligent, adaptive alarms, icons and other information*. K.Mathius, K. Trovato and D.Schaffer. Issued: November 5, 2013
- 13) U.S. Patent Serial # 8,535,336. *Nested cannulae for minimally invasive surgery*. K.Trovato. Issued: September 17, 2013.
- 14) U.S. Patent Serial # 8,518,022 *Electronically and remotely controlled pill and system for delivering at least one medicament*. K. Trovato and G. Spekowius, et al. Issued: August 27, 2013.
- 15) U.S. Patent Serial # 8,417,497. *3D tool path planning, simulation and control system*, K. Trovato; E. Cohen-Solal, D. Summers-Stay. Issued: April 9, 2013.
- 16) U.S. Patent Serial # 8,267,927. *Advanced ablation planning*, S. Dalal; K. Trovato; J. Rusch; J. Kruecker, Issued: Sept 18, 2012.

- 17) U.S. Patent Serial # 8,147,482. *Electronic Capsule for Treating Gastrointestinal Disease*, J.Shimizu and K.Trovato. Issued: April 3, 2012
- 18) Patent Serial# 7,131,134. *Evening Planner*, K.Trovato, J.D. Schaffer, K. Kurapati. Issued: October 31, 2006.
- 19) U.S. Patent Serial# 7,085,747. *Real-Time Event Recommender for Media Programming Using "Fuzzy-Now" And "Personal Scheduler"*, J.D. Schaffer, K.Trovato, K. Kurapati. Appl. No.: 09/963,245 (Disclosure #700980). Issued August 1, 2006.
- 20) U.S. Patent Serial# 7,058,889. *Synchronizing Text/Visual Information with Audio Playback*, K.Trovato, D. Li, M.Ramaswamy. Issued June 6, 2006.
- 21) U.S. Patent Serial# 7,017,172. *Recommender System Using "Fuzzy-Now" For Real-Time Events*, J.D. Schaffer, K. Kurapati, K.Trovato. Issued March 21, 2006.
- 22) U.S. Patent Serial# 6,909,746. *Fast Robust Data Compression Method and System*. K. Trovato. Issued June 21, 2005.
- 23) U.S. Patent Serial # 6,766,374. *System Creating Chat Network Based on A Time of Each Chat Access Request*. Karen Trovato, Paul Rankin, Carolyn Ramsey. Issued: July 20, 2004.
- 24) U.S. Patent Serial # 6,728,581 *Differential Budding: Method and Apparatus for Path Planning With Moving Obstacles And Goals*. Trovato; Karen Irene; Dorst; Leendert. Issued: April 27, 2004.
- 25) U.S. Patent Serial # 6,701,526 *Method and Apparatus for Capturing Broadcast EPG Data For Program Title Display*, Trovato, Karen. Issued: March 2, 2004.
- 26) U.S. Patent Serial #6,683,539 (Disclosure #701-852). *Computer Vision Based Parking Assistant*. Miroslav Trajkovic, Antonio Colmenarez, Srinivas Gutta, Karen Trovato. Issued: January 27, 2004.
- 27) U.S. Patent Serial #6,604,005 (PHA 21,413): *Method and Apparatus for Path Planning*, L.Dorst & K.Trovato. Issued: August 5, 2003. (Filed November 20, 1987.) Copyright for code Tx 3-237-554 11-13-1990. Fed. Circuit Case 33 U.S.P.Q.2d 1194 (Fed Cir. '94) regarding software patentability. See <http://www.uspto.gov/web/offices/com/annual/1995/add-1995.pdf>
- 28) U.S. Patent Serial #6,587,780 (Disclosure #701552). *System and Method for Disseminating Traffic Information (Personalized Traffic Alert System)*. K. Trovato. Issued: July 1, 2003.
- 29) U.S. Patent Serial #6,480,538. *Low Bandwidth Encoding Scheme for Video Transmission*, K. Trovato. Issued November 12, 2002.
- 30) U.S. Patent Serial # 6,469,742. *Consumer Electronic Devices With Adaptable Upgrade Capability*, K. Trovato, W. Lord. Issued October 22, 2002.
- 31) U.S. Patent Serial # 6,445,306 (PHA 23,644, 700-408). *Remote Control Program Selection by Genre*, K. Trovato, P.Rankin, D. Pelletier, J. Martino, C.Ramsey. Issued September 3, 2002.
- 32) U.S. Patent Serial #6,425,012 *System Creating Chat Network Based on a Time of each Chat Access Request*, K. Trovato, P.Rankin, C.Ramsey. Issued: July 24, 2002.
- 33) U.S. Patent Serial #6,324,476. *Method and Apparatus for Identifying or Controlling Travel to a Rendezvous*, K. Trovato. Issued November 27, 2001.

- 34) U.S. Patent Serial #6,183,364. *Simulated Environment Using Procedural Animation in a Simulated City*, K. Trovato. Issued February 6, 2001.
- 35) U.S. Patent Serial #5,870,303. *Method and Apparatus for Controlling Maneuvers of a Vehicle*, K.Trovato and L.Dorst. Issued February 9, 1999. Copyright for code.
- 36) U.S. Patent Serial #5,835,881. *Portable System for Providing Voice Driving Directions*, K. Trovato and D. Pelletier. Issued November 10, 1998.
- 37) U.S. Patent Serial #5,808,887. *Animation of Path Planning*, L.Dorst and K.Trovato. Issued September 15, 1998.
- 38) U.S. Patent Serial #5,788,336. *Anti-Lock Brake Warning System*, K.Trovato and J.Howley. Issued August 4, 1998.
- 39) U.S. Patent Serial #5,696,674. *Computer Animation of a Planned Path in Changing Space*, K. Trovato and L. Dorst. Issued December 9, 1997.
- 40) U.S. Patent Serial #5,663,879. *Method and Apparatus for Smooth Control of a Vehicle with Automatic Recovery from Interference*, K. Trovato and L. Dorst - Generated the application using my skills as a patent agent. Issued September 2, 1997.
- 41) U.S. Patent Serial #5,539,645. *Traffic Monitoring System with Reduced Communications Requirements*, I. Mandhyan and K.Trovato. Issued July 23, 1996.
- 42) U.S. Patent Serial #5,481,111. *Electron Microscope Having a Goniometer Controlled from an Image Frame of Reference*, M.Rosar, K.Trovato, L.Dorst, T.Warmerdam. Issued January 2, 1996.
- 43) U.S. Patent Serial #5,220,497. *Method and Apparatus for Controlling High Speed Vehicles*, K.Trovato and S.Mehta. Issued June 15, 1993.
- 44) U.S. Patent Serial #5,083,256. *Path Planning with Transition Changes*, K.Trovato and L.Dorst. Issued January 21, 1992.
- 45) U.S. Patent Serial #4,949,277. *Differential Budding: Method and Apparatus for Path Planning with Moving Obstacles and Goals*, K.Trovato and L.Dorst. Issued August 14, 1990.

Follow Up Recommendation Occurrence in Different Clinical Settings. Gunn, M.L.* ;Lehnert, B.*; Beauchamp, N. *; Hall, C.S.;Trovato, K.;Dalal, S.; Yetisgen-Yildiz, M.* *Univ. Washington. RSNA 2015 Abstract.

Use of Conditional Statements in Radiology Follow-Recommendation Sentences: Relationship between Conditional Statement Use and Follow Up Compliance. Gunn, M.L.* ;Lehnert, B.*; Beauchamp, N. *; Hall, C.S.;Trovato, K.;Dalal, S.; Yetisgen-Yildiz, M.* *Univ. Washington. RSNA 2015 Abstract.

Follow-up Recommendation Detection on Radiology Reports with Incidental Pulmonary Nodules. Oliveira, L.;Tellis, R.;Qian, Y.;Trovato, K.;Mankovich, G. 15th World Congress on Health and Biomedical Informatics (MEDINFO 2015)

Identification of Incidental Pulmonary Nodules in Free-text Radiology Reports: An Initial Investigation. Oliveira, L.;Tellis, R.;Qian, Y.;Trovato, K.;Mankovich, G. 15th World Congress on Health and Biomedical Informatics (MEDINFO 2015)

In vivo experiment of personalized nested cannulas to reach small airways., K. Trovato, D. Noonan, C. Kung, M. Dreyer, Philips, Dr. R. Yung, Johns Hopkins Univ., Computer Assisted Radiology and Surgery (CARS), June 2013

Path planning for reducing tissue damage in minimally invasive brain access, A. Popovic and K. Trovato, Proceedings of Computer Aided Radiology and Surgery (CARS), Berlin, June 2009.

Automated RFA planning for complete coverage of large tumors, Karen Trovato^a, Sandeep Dalal^a, Jochen Krücker^a, Aradhana Venkatesan^b, Bradford J. Wood^b, ^aPhilips Research North America, ^bNIH, Clinical Center, SPIE Symposium on Medical Imaging, Orlando, February 2009.

Collision-free 6D non-holonomic planning for nested cannulas, K. Trovato and A. Popovic, SPIE Symposium on Medical Imaging, Orlando, February 2009.

Registration Techniques for Image Guided Robotic Surgery, Aleksandra Popovic and Karen I. Trovato, Robotic surgery (book-chapter), Nova Science, 2008.

Non-holonomic 6D planning for deep-reaching dexterous surgical devices, K. Trovato and A. Popovic, Proceedings of Computer Aided Radiology and Surgery (CARS), Barcelona, June 2008.

3D non-holonomic maneuver planning for bronchoscopes and endoscopes, K. Trovato and D. Summers-Stay, Proceedings of Computer Aided Radiology and Surgery (CARS), Berlin, June 2007.

*Differential A**, K. Trovato and L. Dorst, IEEE Transactions on Knowledge and Data Engineering, 14(6):1218--1229, September 2002.

Advanced Vehicle and Infrastructure Systems: Computer Application, Control and Automation, Chapter: *Collision-Free Maneuvering and Control for an Autonomous Vehicle*. Editor: Dr. Christopher Nwagboso. John Wiley and Sons Ltd. 1997.

A* Planning in Discrete Configuration Spaces of Autonomous Systems, Ph.D. Thesis, University of Amsterdam, September 1996. <http://dare.uva.nl/document/2/2036>

General Planning Method for Machine Coordination and Rendezvous, K.Trovato, Invited Paper in Journal of Circuits, Systems and Computers - Automotive Electronics, Vol. 4, No. 4. Dec. 1994.

A Concept for a Mechatronically Controlled Full-Time 4WD x 4WB x 4WA x 4WS Intelligent Vehicle for drivers with Special Needs. Bogdan T. Fijalkowski, Cracow University of Technology & K. Trovato, 27th International Symposium on Automotive Technology & Automation, Aachen, Germany, Sept. 1994.

AI Tools and Applications, Chapter: *General Method for Planning and Rendezvous Problems*. Editor: Dr. Nikolaos G. Bourbakis. World Scientific Publishing Co., 1994.

Autonomous Vehicle Parking and Maneuvering, K. Trovato. International Symposium on Automotive Technology & Automation, Aachen, Germany, Sept. 13-17, 1993.

General Method for Strategic Assessment and Planning Problems, K. Trovato. Invited paper, 1993 Joint Service Data Fusion Symposium, The Johns Hopkins University Applied Physics Laboratory, Laurel, MD, June 1993.

Applications of Learning and Planning Methods, Chapter: *Differential A*: An Adaptive Search Method Illustrated with Robot Path Planning for Moving Obstacles & Goals and an Uncertain Environment*. Editor: Dr. Nikolaos G. Bourbakis. World Scientific Publishing Co. 1991.

Differential A: An Adaptive Search Method Illustrated with Robot Path Planning for Moving Obstacles & Goals and an Uncertain Environment*. K. Trovato. Invited article: International Journal of Pattern Recognition and Artificial Intelligence - Vol. 4, No. 2 June 1990.

The Geometrical Representation of Path Planning Problems, L. Dorst, I.Mandhyan & K. Trovato. Robotics and Autonomous Systems 7, pp. 181-195, Elsevier Science Publishers B.V., 1991.

Other:

Amateur Radio Operator – FCC license: WA2CVU.

Chapter Coordinator, CHADD (Children and Adults with ADD), Westchester-Putnam and Vicinity.

Elder, First Presbyterian Church of Mahopac.

Board member and Treasurer, Mahopac Falls Nursery School.

Real Estate and U.S. Tax law education.

Retired Emergency Medical Technician.

Enjoy water and snow skiing, ultimate Frisbee and old British cars.