Davorin Peceli

Date of Birth: March, 24. 1974.
Address: Jaselska 348/3, 160 00 Prague 6, Czech Republic, EU
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Research Interest:

- Probability, Statistics, Machine Learning, Data Science, Numerical Simulations
- Ultrafast Optics, Nonlinear Optics and Nonlinear dynamics
- Optical System Design, Laser Engineering

Selected Skills:

- Optimization Algorithms: Differential Evolution, Bayesian Optimization, Gradient based optimization algorithms
- Machine learning: Gaussian Processes, Supervised learning (Linear and logistic regression, Support vector machines, decision Trees), Unsupervised learning (K-means), Convolutional Neural Networks, Recurrent Neural Networks, Reinforcement Learning
- Time Series Analysis
- Data Analysis and Visualization using Python and MatLab
- LabView software development for ultrashort laser pulse temporal diagnostic systems
- Experience in designing and building optical systems for linear and nonlinear optical spectroscopy and ultrashort laser pulse temporal diagnostic with nano-, pico- and femtosecond laser systems (Autocorrelation, Pump-probe, Z-scan, Time resolved fluorescence, FROG etc.)
- Alignment of femtosecond dual grating pulse compressor
- Modeling/Programming of Non-Linear Optical processes
- Experience in operating and maintaining temporal diagnostic systems based on Spectral Shearing Interferometry (APE FC SPIDER and Thorlabs 2DSI).
- Experience in operating and maintaining Nd:Yag picosecond laser system with an optical parametric generator/amplifier (OPG/A)(PG401/DFG)

Computer Skills

- Scientific Software: Python (Pandas, NumPy, SciPy, Matplotlib, Seaborn, Scikit-learn), PyTorch, Tensorflow, Anaconda (spyder, jupyter notebook), MatLab 2016, Zemax Optic Studio 15, LabView 2014, OriginPro 9, SNLO and Mathcad 14.
- Operating Systems: Microsoft Windows 11 and previous versions.
- Business Software: Microsoft Office Professional Plus 365 (Access, Excel, Outlook, Powerpoint, Word), Adobe Acrobat

Education:

PhD in Optics and Photonics, March 2013
CREOL, College of Optics and Photonics, University of Central Florida
Dissertation title: “Absorptive and Refractive Optical Nonlinearities in Organic Molecules and Semiconductors”

M.S. in Optics and Photonics, January 2008
CREOL, College of Optics and Photonics, University of Central Florida

B.S. in Physics, March 2003
University of Zagreb, Faculty of Science, Department of Physics
Thesis title: "Nuclear Equation of State and Neutron Star Structure"

Online courses from edX
Introduction to Computer Science and Programing Using Python (MITx - 6.00.1x) (certified)
Introduction to Computational Thinking and Data Science (MITx - 6.00.2x) (certified)
Probability – The Science of Uncertainty and Data (MITx – 6.431x) (certified)
Fundamentals of Statistics (MITx – 18.6501x) (certified)
Machine Learning with Python-from Linear Models to Deep Learning (MITx - 6.86x) (certified)
Data Analysis: Statistical Modeling and Computation in Applications (MITx - 6.419x) (certified)

Experience:

Lawrence Livermore National Laboratory, Livermore, California 2016
- Implementation of the Power Amplifier Diagnostic (PAD) into the High Repetition Rate Advanced Petawatt Laser System (HAPLS)

Extreme Light Infrastructure, Prague, Czech Republic 2013-present
Senior Laser Scientist
- Application of MLand AI tools in high power laser sustems
- Technical Design and Software Development for HAPLS Temporal Diagnostic Package
- Implementation of APE FC SPIDER software on a Real Time Operating System.
- Technical Design and Software Development of Second and Third Order Autocorrelators
- Temporal contrast and Spatial-temporal coupling diagnostics for ultrashort laser pulses

CREOL, College of Optics and Photonics,
University of Central Florida, 2005-2013
Graduate student in Nonlinear Optics group (NLO) under supervision of Prof. Eric W. Van Stryland and Prof. David J. Hagan:
- Linear and nonlinear optical characterization of π-conjugated organic materials (emphasize on molecules with large two photon absorption cross section and triplet quantum yield), photocromics, thin films, organic and inorganic nanomaterials.
- Two and three photon absorption and nonlinear refraction in semiconductors.
- Hands on experience on operating and maintaining EKSPLA PL2143 10Hz Nd:YAG picosecond laser and optical parametric amplifiers (OPG/OPA)(PG401/DFG).
- surface plasmon enhancement of two photon absorption
- temporal and spectral properties of "n_2" for carbon disulfide
- optical limiting properties of graphene oxide

Central Bureau of Statistic - IT sector, Zagreb, Croatia 2003-2005
- Implementation of Neuchatel Terminology Model in cooperation with Swedish and German Statistical Institutions
- Reconstruction of existing host text files to relational databases

Rudjer Boskovic Institute, Zagreb, Croatia, 2000-2003
Laboratory for Heavy-Ion Physics and Laboratory for Nuclear Reactions
- Analysis of experimental data

Journal Articles:

1. Schillaci, F.; Giuffrida, L.; Tryus, M.; Grepl, F.; Stancek, S.; Velyhan, A.; Istokskaia, V.; Levato, T.; Petringa, G.; Cirrone, G.A.P.; et al. The ELIMAIA Laser–Plasma Ion Accelerator: Technological Commissioning and Perspectives. *Quantum Beam Sci.* **2022**, *6*, 30.
2. Tryus, M.; Grepl, F.; Chagovets, T.; Velyhan, A.; Giuffrida, L.; Stancek, S.; Kantarelou, V.; Istokskaia, V.; Schillaci, F.; Zakova, M.; et al. TERESA Target Area at ELI Beamlines. *Quantum Beam Sci.* 2020, *4*, 37.
3. S. Benis, C. M. Cirloganu, N. Cox, T. Ensley, H. Hu, G. Nootz, P. D. Olszak, L. A. Padilha, **D. Peceli**, M. Reichert, S. Webster, M. Woodall, D. J. Hagan, and E. W. Van Stryland, "Three-photon absorption spectra and bandgap scaling in direct-gap semiconductors," Optica 7, 888-899 (2020)
4. M. Durak, D. Kramer, P. K. Vlepula, J. Cupal, T. Medrik, J. Hrebicek, J. Golasowski, **D. Peceli**, M. Kozlova, B. Rus, ″Laser-induced damage threshold tests of ultrafast multilayer dielectric coatings in various environmental conditions relevant for operation of ELI beamlines laser systems", *Optical Engineering* 56(1) (2017)
5. T. R. Ensley, H. Hu, M. Reichert, M. R. Ferdinandus, **D. Peceli**, J. M. Hales, J. W. Perry, Z. Li, S.Jang, A. K.-Y. Jen, S. R. Marder, D. J. Hagan, and E. W. Van Stryland, "Quasi-three-level model applied to measured spectra of nonloinear absorption and refraction in organic molecules", *Journal of the Optical Society of America* B 33(5) 1007-1007 (2016).
6. M. Reichert, H. Hu, M. R. Ferdinandus, M. Seidel, P. Zhao, T. R. Ensley, **D. Peceli**, J. M. Reed, D. A. Fishman, S. Webster, D. J. Hagan, and E. W. Van Stryland, "Temporal, spectral, and polarization dependence of the nonlinear optical response of carbon disulfide", Optica, Vol. 1, 436-445 (2014).
7. **D.Peceli**, S. Webster, C. Cirloganu, D. A. Fishman, H. Hu, O. V. Przhonska, V. V. Kurdyukov, Y. L. Slominsky, A. I. Tolmachev, A. D. Kachkovski, R. R. Dasari, S. Barlow, S. R. Marder, D. J. Hagan, and E.W. Van Stryland, "Enhanced Intersystem Crossing Rate in Polymethine-Like Molecules: Sulfur-Containing Squaraines versus Oxygen-Containing Analogues" *Journal of Physical Chemistry A,* 117, 2333-2346 (2013).
8. **D.Peceli**, S. Webster, C. Cirloganu, D. A. Fishman, H. Hu, O. V. Przhonska, V. V. Kurdyukov, Y. L. Slominsky, A. I. Tolmachev, A. D. Kachkovski, R. R. Dasari, S. Barlow, S. R. Marder, D. J. Hagan, and E.W. Van Stryland, "Optimization of Double Pump-Probe Method for Triplet Yield Determination", *Journal Of Physical Chemistry A* 116(20), 4833-4841 (2012).
9. H. Hu, D.A. Fishman, A. Gerasov, O.V. Przhonska , S. Webster, L.A. Padilha, **D. Peceli**, M. Shandura, Y.P. Kovtun, A.D. Kachkovski, A.E. Masunov, T.V. Timofeeva, D.H. Hagan, and E.W. Van Stryland, "Two-photon absorption of single crystal of a cyanine-like dye", *Journal Of Physical Chemistry Letters* 3(9), 1222-1228 (2012).
10. L.A. Padilha, S. Webster, O.V. Przhonska, H. Hu, **D. Peceli**, T.R. Ensley, M.V. Bondar, A.O. Gerasov, Y.P. Kovtun, M.P. Shandura, A.D. Kachkovski, D.J. Hagan, E.W. Van Stryland,
11. ″Efficient Two-Photon Absorbing Acceptor-pi-Acceptor Polymethine Dyes", *Journal of Physical Chemistry* 114(23), 6493-6501(2010).
12. S. Webster, **D. Peceli**, H. Hu, L.A. Padilha, O.V. Przhonska, A.E. Masunov, A.O. Gerasov, A.D. Kachkovski, Y.L. Slominsky, A.I. Tolmachev, V.V. Kurdyukov, O.O. Viniychuk, E. Barrasso, R. Lepkowicz, D.J. Hagan, E.W. Van Stryland, ″Near-Unity Quantum Yields for Intersystem Crossing and Singlet Oxygen Generation in Polymethine-like Molecules: Design and Experimental Realization″, *Journal of Physical Chemistry Letters* **1**(15), 2354-2360 (2010).
13. S. Webster, S.A. Odom, L.A. Padilha, O.V. Przhonska, **D. Peceli**, H. Hu, G. Nootz, A.D. Kachkovski, J. Matichak, S. Barlow, H.L. Anderson, S.R. Marder, D.J. Hagan and E.W. Van Stryland , "Linear and

Nonlinear Spectroscopy of a Porphyrin-Squaraine-Porphyrin Conjugated System", *J. Phys. Chem.* B, 113(45), 14854-14867(2009)

14. L.A. Padilha, S. Webster, O.V. Przhonska, H. Hu, **D. Peceli**, J.L. Rosch, M.V. Bondar, A.O. Gerasov, Y.P. Kovtun, M.P. Shandura, A.D. Kachkovski, D.J. Hagan, and E.W. Van Stryland, "Nonlinear absorption in a series of Donor-p-Acceptor cyanines with different conjugation lengths", J. Mater. Chem. **19**, 7503(2009)
15. I.-C. Khoo, S. Webster, S. Kubo, W. Justin Youngblood, J. Liou, A. Diaz, T.E. Mallouk, P. Lin, **D. Peceli**, L.A. Padilha, D.J. Hagan, and E.W. Van Stryland, ″Synthesis and characterization of the multi-photon absorption and excited-state properties of 4-propyl 4'-butyl diphenyl acetylene″, *J. Mater. Chem.* 19, 7525(2009)
16. S.A. Odom, S. Webster, L.A. Padilha, **D. Peceli**, H. Hu, G. Nootz, S.J. Chung, J.D. Matichak, O.V. Przhonska, A.D. Kachkovski, S. Barlow, H.L. Anderson, D.J. Hagan, E.W. Van Stryland, and S.R. Marder, "Synthesis and Two-Photon Spectrum of a Bis(Porphyrin)-Substituted Squaraine", JACS, 131, 7510-7511(2009)

Conference Presentations:

- I. M. Anjum, **D. Peceli**, F. Capuano, and B. Rus, "High-Power Laser Pulse Shape Optimization with Hybrid Stochastic Optimization Algorithms," in *Frontiers in Optics + Laser Science 2024 (FiO, LS)*, Technical Digest Series (Optica Publishing Group, 2024), paper JD4A.55
- F. Capuano; **D. Peceli**; G. Tiboni; R. Camoriano; B. Rus, "TempoRL: laser pulse temporal shape optimization with deep reinforcement learning", SPIE 12577, High-power, High-energy Lasers and Ultrafast Optical Technologies, 125770C (9 June 2023)
- F. Capuano, **D. Peceli**, B. Rus, G. Tiboni, and A. Špaček, "Laser Pulse Duration Optimization with Numerical Methods", in *Proc. 13th Int. Workshop Emerging Technol. Sci. Facil. Controls (PCaPAC'22)*, Dolní Brežany, Czech Republic, Oct. 2022, pp. 37-40. doi:10.18429/JACoW-PCaPAC2022-THPP5
- S. Benis, C. M. Cirloganu, G. Nootz, P. D. Olszak, L. A. Padilha, **D. Peceli**, M. Reichert, S. Webster, T. Ensley, H. Hu, M. Woodall, D. J. Hagan, and E. W. Van Stryland, "Three-Photon Absorption Spectra and Bandgap Scaling in Direct-Gap Semiconductors," in *14th Pacific Rim Conference on Lasers and Electro-Optics (CLEO PR 2020)*, OSA Technical Digest (Optica Publishing Group, 2020), paper C7B_2.
- S. Vyhlídka, P. Trojek, D. Kramer, **D. Peceli,** F. Batysta, J. Bartoníček, J. Hubáček, T. Borger, R. Antipenkov, E. Gaul, T. Ditmire, B. Rus, "Temporal diagnostics for kJ class laser using object-image-grating self-tiling compressor," Proc. SPIE 11034, Short-pulse High-energy Lasers and Ultrafast Optical Technologies, 1103409, 2019
- T. Spinka, E. Sistrunk, A. Bayramian, et al. " Commissioning Results of the World's First Diode-Pumped 10Hz PW Laser", Conference on Lasers and Electro-Optics Europe / European Quantum Electronics Conference, Munich, 2017
- E. Sistrunk, T. Spinka, A. Bayramian, et al. "All Diode-Pumped, High-repetition-rate Advanced Petawatt Laser System (HAPLS)", Conference on Lasers and Electro-Optics (CLEO) Location: San Jose, CA, 2017
- C. L. Haefner, A. Bayramian, S. Betts, et al. "High average power, diode pumped Petawatt laser systems: a new generation of lasers enabling precision science and commercial applications", Conference on Research Using Extreme Light - Entering New Frontiers with Petawatt-Class Lasers III, 2017

- B. Rus, P. Bakule, D. Kramer, et al. ”ELI-Beamlines: Development of next generation short-pulse laser systems”, Conference on Research Using Extreme Light - Entering New Frontiers with Petawatt-Class Lasers II, Conference on Research Using Extreme Light - Entering New Frontiers with Petawatt-Class Lasers III, 2017
- M. Durak, P.K. Velpula, J. Cupal, T. Medrik, J. Hrebicek, J. Golasowski, **D. Peceli**, L. Fekete, V. Stepana, B. Rus, ”Ultrafast beam dump materials and mirror coatings tested with the ELI beamlines LIDT test ttation”, SPIE 9632, Laser-Induced Damage in Optical Materials 2015
- H. Hu, T.R. Ensley, M. Reichert, M.R. Ferdinandus, **D. Peceli**, O.V. Przhonska, S.R. Marder, A. K-Y Jen, J.M. Hales, J.W. Perry, D.J. Hagan, & E.W. Van Stryland, ″Optimization of the Electronic Third-order Nonlinearity of Cyanine-like Molecules for All Optical Switching″, Photonics West, San Francisco, 2015
- D. Kramer, R. Barros, T. Medrik, J. Hrebicek, **D. Peceli**, M. Durak, M. Kozlova, B. Rus, ”Commissioning and first results of the ELI-beamlines LIDT test station”, SPIE 8885, Laser-Induced Damage in Optical Materials 2013
- **D. Peceli**, P. Olszak, C. Cirloganu, S. Webster, L. Padilha, T. Ensley, H. Hu, G. Nootz, D. Hagan, and E. W. Van Stryland, ″Three-photon absorption of GaAs and other semiconductors″, OSA Topical Conference, Nonlinear Optics 2013, Kohala Coast, Fairmont Hotel, Hawaii, talk NTu1B.6
- **D. Peceli**, H. Hu, S. Webster, D. Fishman, O. Przhonska,V. V. Kurkyukow, Y. L. Slominsky, A. D. Kachkovski, D. J. Hagan, E. W. Van Stryland ″Nonlinear optical study of oxygen-sulfur squaraines″, CLEO QELS 2012, San Jose, CA, paper JW4A.48
- **D. Peceli**, S. Webster, D. Fishman, C. Cirloganu, H. Pattanaik, H. Hu, O.V. Przhonska, V. Kurdyukov, Y. L. Slominsky, A. I. Tolmachev, A. D. Kachkovski, R. R. Dasari, S. Barlow, S. R. Marder, D. J. Hagan, E. W. Van Stryland, “Advance in Double Pump-Probe Technique for Triplet Quantum Yield Determination”, CLEO: Science and Innovations (CLEO: S and I) 2011 paper: CTuY4
- **D. Peceli**, A. O. Gerasov, S. Webster, Scott; H. Hu, L. Padilha, V. V. Kurdyukov, Y. L. Slominsky, O. O. Viniychuk, A. D. Kachkovski, A. E. Masunov, O. V. Przhonska, D. J. Hagan, E. W. Van Stryland, “Effective Generation of Triplet States and Singlet Oxygen by Sulfur-Containing Squaraines: Experimental and Theoretical Study”, Conference on Lasers and Electro-Optics (CLEO) 2010 paper: CTuR5
- E. W. Van Stryland, T. Ensley, H. Hu, M Seidel, **D. Peceli**, D. Fishman, S. Webster, and D. J. Hagan, ”Nonlinear Spectroscpy”, 12th International Conference on Organic Nonlinear Optics and the International Conference on Organic Photonics and Electronics (ICONO12/ICOPE), (2011)
- O. Kahl, **D. Peceli**, S. Webster, C. Toro, L.A. Padilha, D. Fishman, J.P. Fontana, A. Agarwal, N.A. Kotov, P. Palffy-Muhoray, D.J. Hagan, and E.W. Van Stryland, ”Linear and Nonlinear Optical Response of Metal Nanoparticles in Various Hosts” AFOSR 2011 Joint Electronics Program Review, (2011).
- D.Hagan, E Van Stryland, S. Webster, L. Padilha, O.V. Prjonskaja, G. Nootz, H. Hu, S. Fardad, T. Ensley, D. Peceli, P. Olszak, C. Cirloganu, O. Kahl, and A. Hand, ”Nonlinear Optical Maeasurement and Modeling Techniques: Materials Characterizations” Dayton Modeling Workshop (2009)
- S. Webster, L. A. Padilha, O. V. Przhonska, **D. Peceli**, H. Hu, Y. L. Slominsky, A. D. Kachkovski, A. I. Tolmachov, V. V. Kurdyukov, D. J. Hagan, DaE. W. Van Stryland, “Enhancement of Triplet Yields in Cyanine-Like Molecules”, Laser Science (LS) 2009 paper: LSTuG2
- H. Hu, L. A. Padilha, S. Webster, T. Ensley**, D. Peceli**, O. V. Przhonska, D. J. Hagan, E. W. Van Stryland, M. V. Bondar, Y. L. Slominsky, A. D. Kachkovski, A. O. Gerasov, M. P. Shandura, M. P. Shandura, Y. P. Kovtun, “Comparison of Linear and Nonlinear Absorption in Three Series of Similar Cyanine Dyes: D-π-D, A-π-A and D-π-A”, Nonlinear Optics: Materials, Fundamentals and Applications (NLO) 2009 paper: JWA17

- S. Webster, S. A. Odom, L. A. Padilha, O. V. Przhonska, **D. Peceli**, H. Hu, G. Nootz, A. D. Kachkovski, J. Matichak, S. Barlow, H. L. Anderson, S. R. Marder, H. J. Hagan, E. W. Van Stryland, "Nonlinear Absorption Spectroscopy of a Bis(Porphyrin)-Substituted Squaraine", Nonlinear Optics: Materials, Fundamentals and Applications (NLO) 2009 paper: JWA16
- H. Hu, L. A. Padilha, S. Webster, **D. Peceli**, O. V. Przhonska, D. J. Hagan, E. W. Van Stryland, A. O. Gerasov, M. P. Shandura, Y. P. Kovtun, A. D. Kachkovski, "Linear and Nonlinear Absorption Properties of D-π-A Polymethine Dyes", Conference on Lasers and Electro-Optics (CLEO) 2009 paper: CFQ5
- S. Webster, S. A. Odom, **D. Peceli**, L. A. Padilha, O. V. Przhonska, H. Hu, G. Nootz, A. D. Kachkovski, S. Barlow, H. L. Anderson, S. R. Marder, D. J. Hagan, E. W.Van Stryland, "Temporal and Spectral Nonlinear Absorption Characterization of a Hybrid Porphyrin-Squaraine-Porphyrin Macromolecule", Laser Science (LS) 2008 paper: LWC4
- **D. Peceli**, C. Cirloganu, S. Webster, L. A. Padilha, D. J. Hagan, E. W. Van Stryland, S. Odom, J. Matichak, S. Barlow, R. R. Dasari, S. R. Marder, " Characterization of Nonlinear Molecular Dynamics Using The Double Pump Probe Technique", Frontiers in Optics (FiO) 2008 paper: FThO3

Journal Reviewer: Optical Material Express