

İTÜ



MATEMATİK BÖLÜMÜ

Using decision tree regression for self-tuning mode-locked lasers

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This study proposes an adaptive control and self-tuning algorithm for mode-locked fiber lasers. The algorithm has three main stages: the birefringence estimation, maximum seeking, and adaptive control. The cavity birefringence is recognized by a decision tree regressor. The optimal position of the polarizer is detected by a maximum seeking algorithm, which involves a novel, to our knowledge, objective function. Thus, the maximal nonlinear polarization rotation is detected by an alternative approach. The adaptive control of the fiber-laser is achieved by combining the birefringence estimation and maximum seeking algorithms, and it is demonstrated that the proposed methodology can keep the fiber-laser mode-locked under varied conditions of cavity birefringence. It is noted that the proposed adaptive control and self-tuning algorithm is equation-free and can be applied to different configurations of mode-locked fiber lasers.

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About the speaker:

Mahmut Bađcı received his B.Sc. in Physics Engineering at Istanbul Technical University , and he completed his M.Sc. and PhD in Mathematics Engineering at the same university. After his doctoral studies, he conducted postdoctoral research at University of Washington in the area of Applied Mathematics.

His research interests lie in numerical analysis, numerical algorithms, financial economics, computer learning, artificial intelligence and optics & fotonics.

During his academic career, he worked as a lecturer at Istanbul Kavram Vocational College of Higher Education, and as an assistant professor at Istanbul Bilgi University, Istanbul Beykoz University, Yeditepe University and Marmara University. Now he is an associate professor in the Department of Management Information Systems at Marmara University.