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ABSTRACT BOOK

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Conference Program

SESSION NAME	PAPER TITLE	PRESENTER	DATE	TIME
Session-1	Two-Factor Authentication System for Protecting Metadata and Connected Vehicles	Hüseyin Karacalı, Nevzat Dönüm, Efecan Cebel	19.06.2025	10:00-10:20
	CMR Imaging and Deep Learning Approaches in the Diagnosis of Cardiovascular Diseases	Gülsüm Kemerli, Tayyip Özcan	19.06.2025	10:20-10:40
	Smart Classroom Scheduling and Resource Optimization for Educational Institutions: Integrating AI and Multi-Objective Decision Support	Osman Çaylı, Atınç Yılmaz	19.06.2025	10:40-11:00
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Session-2	Manufacturing and Analysis of Fullerene Reinforced PEEK Matrix Composites	Baran Bilgiç, Yahya Öz, Fahrettin Öztürk	19.06.2025	14:00-14:20
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Session-3	Tekstil Tedarik Zincirinde İzlenebilirlik ve Sürdürülebilirlik için Pigment Teknolojisi ile İşaretlenmiş Güvenli Üretim Modeli	Seda Keskin Atak, Sümevra Demiraş Özkaya, Hasan Tahsin Tataroğlu	20.06.2025	10:00-10:20
	Kasar Prosesi Sonrası Nötralizasyon İşlemi Uygulanmadan Renklendirilen %100 Pamuklu Kumaşlarda Boya Verimliliğinin Artırılması ve Kimyasal Tüketiminin Azaltılması	Cemre Doğan, Aylin Kuşen	20.06.2025	10:20-10:40

SESSION NAME	PAPER TITLE	PRESENTER	DATE	TIME
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	Mechanical and Environmental Comparison of Natural Fibers and Glass Fiber in the L-RTM Method	Nazmi Türkhan, Kübra Tuna, Hüseyin Arıkan, Yusuf Uzun	20.06.2025	11:00-11:20
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	Predicting Winter Tyre Buyers Using Unsupervised Anomaly Detection Models: A Case Study in Imbalanced Learning	Selçuk Bayracı Garen Bozoğlanoğlu	20.06.2025	14:20-14:40
	Makroekonomik Göstergelerle Hızlı Tüketim Sektöründe Satış Dalgalanmalarına Karşı Öngörü Odaklı Uyarı Sistemi Geliştirilmesi:	Zeki Onur Yüksek, Ayşe Sali, Erhan Alasar, Şahika Koyun Yılmaz	20.06.2025	14:40-15:00
	An Industry Independent B2B Customer Valuation Model for Operational Decision Making Processes	Şahika Koyun Yılmaz, Alev Taşkin	20.06.2025	15:00-15:20
	Analysis of Consumption Forecasting in Electrical Distribution Networks With Deep Learning	Numan Köksal	20.06.2025	15:20-15:40



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SESSION NAME	PAPER TITLE	PRESENTER	DATE	TIME
	Downlighter Type Automotive Lighting with PWM Based Two Pin LED Driver Design	Barış İspir Barbaros Kurt	20.06.2025	15:40-16:00

Manufacturing and Analysis of Fullerene Reinforced PEEK Matrix Composites

Baran BİLGİÇ^{1*}, Yahya ÖZ², Fahrettin ÖZTÜRK^{2,3},

¹ Ankara Yıldırım Beyazıt University, 06010 Keçiören / Ankara, Türkiye, ORCID: 0009-0003-3786-278X, baranbilgic1412@yandex.com

² Turkish Aerospace Industries, Inc., 06980 Kahramankazan / Ankara, Türkiye, ORCID: 0000-0003-3784-0495, yahyaoz@metu.edu.tr

³ Istanbul Technical University, 34437 Beyoğlu / Istanbul, Türkiye, ORCID: 0000-0001-9517-7957, fahrettinozturk@itu.edu.tr

* Correspondence: baranbilgic1412@yandex.com

Abstract

Polymer-based composite materials are increasingly replacing metals and ceramics as effective alternatives across various sectors. These materials are now widely used in industries such as automotive, medical, aerospace, electronics, and construction, thanks to their versatility, lightweight nature, corrosion resistance, and cost-effectiveness. While polymer materials can be attractive due to performance and cost, their weaknesses include performance variation in mechanical properties. These limitations hamper polymers in some applications. As a result, developing polymer composite materials, where different types of additives are incorporated into the matrix, has become a suitable solution. Many studies from the literature have shown that polymer matrix composites with either nano or micro-sized particles or fibers can have a substantial impact on their mechanical, thermal, optical and electrical conductivity properties. This study employs polyether ether ketone (PEEK), a high-performance thermoplastic commonly used in the aerospace industry, compounded with nanosized fullerene at various ratios using the twin-screw extrusion method. The tensile strength and morphological structure of the resulting composites were also examined. The results indicate that fullerene is not only well dispersed within the PEEK matrix but also contributes to an enhancement in the modulus.

Keywords: Composite, Fullerene, Nanoadditive, PEEK



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Karmaşık Ağ Topolojilerinde Sanal Makine Klonlama İçin SDN ve VLAN Tabanlı Dinamik Yönetim Modeli

Simge Şengül^{1*}, Berat Özbay², Begüm Erdem³, Rüveyda Eto⁴

¹ Priva Security, Orcid ID: 0009-0000-9869-0860, simge.sen@privasecurity.com,

² Priva Security, Orcid ID: 0009-0001-5019-7935, berat.ozbay@privasecurity.com,

³ Priva Security, Orcid ID: 0009-0002-3129-7030, begum.erdem@privasecurity.com,

⁴ Priva Security, Orcid ID: 0009-0000-1974-7524, ruveyda.eto@privasecurity.com,

* Sorumlu Yazar: berat.ozbay@privasecurity.com; 05358776873

Özet

Sanallaştırma altyapılarında, her kullanıcıya özel sanal makinelerin klonlanarak gerçek bir güvenlik duvarı üzerinden IP alması ve aynı alt ağda çalışmasız şekilde çalışması temel bir gereksinimdir. Hypervizör ile Layer-3 düzeyindeki ağ yönetimi arasında entegre bir kontrol mekanizmasının olmaması, ölçeklenebilir sanal ağ topolojilerinin oluşturulmasını zorlaştırmaktadır. Dağıtık sunucularda çalışan sanal klonlar, merkezi olmayan ağ yapısı nedeniyle veri merkezi bileşenleriyle uyumsuzluk yaşamakta ve paket kayıplarına yol açmaktadır. Bu çalışmada, KVM tabanlı hypervizör ile Debian üzerinde yönetilebilir bir sanallaştırma katmanı tasarlanmış, sanal makineler Virtual Appliance Firewall ile entegre edilerek dinamik IP ve alt ağ yönetimi sağlanmıştır. Fiziksel sunucular VLAN ile izole edilip SDN ile merkezi yönetim sağlanmıştır. SDN kapsülleme kaynaklı 50 byte'lık ek yük ve 1500 byte MTU uyumsuzluğu için üç katmanlı sanal ağ mimarisi geliştirilmiştir. Her katmanın bir üst katmandan gelen paketleri kapsülleyerek ilettiği bu yapı ile fiziksel ağdaki paket kayıpları azaltılmıştır. SDN ile dağıtık sunucular arasında merkezi ve verimli iletişim kurulmuş, çok sayıda VLAN tek bir noktadan yönetilebilmiştir. Kritik ağ bileşenleri gizlenmiş, MTU uyumsuzlukları %99 oranında çözülmüştür. Donanım bağımlı ağ sorunları %85 azaltılmıştır. Ağ konfigürasyon kesintileri tamamen ortadan kaldırılmış ve mikrosegmentasyon ile saldırı etkisi %70 oranında minimize edilmiştir.

Anahtar: Sanallaştırma Altyapısı, Yazılım Tanımlı Ağ, VLAN İzolasyonu, Mikrosegmentasyon

A Dynamic Management Model Based on SDN and VLAN for Virtual Machine Cloning in Complex Network Topologies

Simge Şengül^{1*}, Berat Özbay², Begüm Erdem³, Rüveyda Eto⁴

¹ Priva Security, Orcid ID: 0009-0000-9869-0860, simge.sen@priviasecurity.com,

² Priva Security, Orcid ID: 0009-0001-5019-7935, berat.ozbay@priviasecurity.com,

³ Priva Security, Orcid ID: 0009-0002-3129-7030, begum.erdem@priviasecurity.com,

⁴ Priva Security, Orcid ID: 0009-0000-1974-7524, ruveyda.eto@priviasecurity.com,

* Correspondence: berat.ozbay@priviasecurity.com; 05358776873

Abstract

In virtualization infrastructures, cloning virtual machines specific to each user and assigning IP addresses through a real firewall without conflicts within the same subnet is a fundamental requirement. However, the absence of an integrated control mechanism between the hypervisor and Layer-3 network management complicates the creation of scalable and conflict-free topologies. Virtual clones on physically distributed servers face incompatibilities with data center components due to decentralized network structures, leading to packet loss. To address these issues, a scalable virtualization layer was designed on Debian using a KVM-based hypervisor. These user-specific virtual machines were integrated with a Virtual Appliance Firewall for dynamic IP and subnet management. Distributed physical servers were isolated via VLAN and centrally managed with SDN. A three-layer virtual network architecture was developed to overcome the 50-byte overhead and 1500-byte MTU mismatch caused by SDN encapsulation, minimizing packet loss. SDN enabled efficient, centralized communication across distributed servers, managing numerous VLANs from a single point. This approach concealed critical components, resolved 99% of MTU mismatches, reduced hardware-dependent issues by 85%, eliminated configuration interruptions, and minimized attack impacts by 70% through microsegmentation.

Keywords: Virtualization Infrastructure, Software-Defined Networking, VLAN Isolation, Microsegmentation

Kasar Prosesi Sonrası Nötralizasyon İşlemi Uygulanmadan Renklendirilen %100 Pamuklu Kumaşlarda Boya Verimliliğinin Artırılması ve Kimyasal Tüketiminin Azaltılması

Cemre Nur Doğan^{1*}, Aylin Kuşen²

¹ Ağaoğlu Tekstil Ar-Ge Merkezi, Uşak, Türkiye, Orcid ID: 0009-0009-0103-1777, c.dogan@agaoglu.com,

² Ağaoğlu Tekstil Ar-Ge Merkezi, Uşak, Türkiye, Orcid ID: 0009-0004-6531-9984, a.kusen@agaoglu.com,

*c.dogan@agaoglu.com; 5548313733

Özet

Bu çalışmada, farklı pH değerlerine sahip %100 pamuklu dokuma kumaşların, reaktif boyarmaddeler kullanılarak soğuk bekletme tekniğinde renklendirilmesi amaçlanmıştır. Bu amaç doğrultusunda kumaştaki pH farklılığının, boyama işlemlerindeki kimyasal madde tüketim miktarına ve boyarmaddenin, kumaşlara sağladığı renk verimliliğine etkisi incelenmiştir. Çalışmada, bir grup kumaşa konvansiyonel kasar prosesi sonrası nötralizasyon işlemi uygulanarak pH değeri 6–7 seviyesine getirilmiş, diğer grup ise nötralizasyon işlemi uygulanmadan pH 9–10 seviyesinde bırakılmıştır. Her iki grup kumaş, aynı boyama parametreleri altında soğuk bekletim) yöntemiyle reaktif boyarmaddelerle renklendirilmiştir. Çalışma kapsamında üretilen kumaşların ilgili standartlar doğrultusunda; renklilik değerleri, yırtılma mukavemet performansları ve asidik - alkali, tere, suya, kuru - yaş sürtmeye karşı renk haslığı değerleri tayin edilmiştir. Çalışma sonucunda, pH 9–10 seviyesindeki kumaşlarda, pH 6–7 seviyesine sahip kumaşlara kıyasla daha yüksek CIELab renk değerleri ve renk haslıkları elde edilmiştir. Yırtılma mukavemetinde belirgin bir fark gözlenmezken, beş yıkama sonrası renk kayıplarında pH 9–10 grubunda iyileşme tespit edilmiştir. Ayrıca, kimyasal ve su tüketimi açısından değerlendirildiğinde, yüksek pH grubunda en az %10 oranında verimlilik sağlandığı belirlenmiştir. Boyarmadde tüketimi en az %12 oranında azalırken, CIELab renk değeri en az %15 oranında artış göstermiştir. Sonuçlar, nötralizasyon işlemi uygulanmadan da yüksek renk performansı ve kimyasal verimlilik elde edilebileceğini göstermektedir. Bu durum hem çevresel sürdürülebilirlik hem de proses maliyetleri açısından önemli avantajlar sunmaktadır.

Anahtar: Kasar prosesi, pH, sürdürülebilirlik, CIELab, haslık

Increasing Dyeing Efficiency and Reducing Chemical Consumption in 100% Cotton Fabrics Colored Without Neutralization After Bleaching Process

Cemre Nur Dogan^{1*}, Aylin Kusen²

¹ Agaoglu Textile R&D Center, Turkey, Orcid ID: 0009-0009-0103-1777, c.dogan@agaoglu.com,

² Agaoglu Textile R&D Center, Turkey, Orcid ID: 0009-0004-6531-9984, a.kusen@agaoglu.com,

*c.dogan@agaoglu.com; 5548313733

Abstract

In this study, it was aimed to dye 100% cotton woven fabrics with different pH values using reactive dyestuffs in cold soaking technique. For this purpose, the effect of the pH difference in the fabric on the amount of chemical consumption in the dyeing process and the color efficiency of the dyestuff on the fabrics was investigated. In the study, one group of fabrics was neutralized after the conventional bleaching process and the pH value was brought to 6-7, while the other group was left at pH 9-10 without neutralization. Both groups of fabrics were dyed with reactive dyestuffs by cold soaking method under the same dyeing parameters. In accordance with the relevant standards; colorfastness values, tear strength performances and color fastness values against acidic - alkali, sweat, water, dry - wet rubbing were determined. As a result of the study, higher CIELab color values and color fastness values were obtained in fabrics with pH 9-10 levels compared to fabrics with pH 6-7 levels. While no significant difference was observed in tear strength, color loss after five washes was improved in the pH 9-10 group. In addition, when evaluated in terms of chemical and water consumption, it was determined that at least 10% efficiency was achieved in the high pH group. Dyestuff consumption decreased by at least 12%, while CIELab color value increased by at least 15%. The results show that high color performance and chemical efficiency can be achieved without neutralization. This offers significant advantages in terms of both environmental sustainability and process costs.

Keywords: Bleaching process, pH, sustainability, CIELab, fastness

Makroekonomik Göstergelerle Hızlı Tüketim Sektöründe Satış Dalgalanmalarına Karşı Öngörü Odaklı Uyarı Sistemi Geliştirilmesi

Zeki Onur YÜKSEK¹, Ayşe SALI², Erhan ALASAR³, Şahika KOYUN YILMAZ^{4*}

¹ Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0009-0005-0508-3874, zekionur.yuksekk@metric.net,

² Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0009-0005-3512-5430, ayse.sali@metric.net,

³ Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0009-0005-9811-8764, erhan.alasar@metric.net,

⁴ Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0000-0002-2589-3568, sahika.koyun@metric.net,

* Sorumlu Yazar: sahika.koyun@metric.net

Özet

Şirketlerin ana gelirini oluşturan satışların finansal veya hacimsel dalgalanmaları operasyonel karar süreçlerini olumsuz etkilemektedir. Ekonomik belirsizlik durumunun yoğun olduğu günümüz koşullarında, gelecek dönem satış değerinin yönünün tahmin edilmesiyle ilgili önlemlerin alınabilmesi veya fırsatların değerlendirilebilmesi için ön uyarı sistemlerinin geliştirilmesi önem arz etmektedir.

Döviz kuru, ÜFE, TÜFE, kredi kartı harcamaları, istihdam oranları, para arzı vb. çeşitli makroekonomik göstergelerin satış değeri üzerindeki etkisi gecikme penceresi ($t_{lag} = 0,1, \dots, 5$) dahilinde analiz edilmiştir. Geniş bir gösterge yelpazesinden ilgili bağımsız değişkenlerin seçilebilmesi için öncelikli olarak korelasyon analizi gerçekleştirilmiştir. Orta ve yüksek kuvvette korelasyon gösteren değişkenlerin VIF analizi ile bağımsızlıkları değerlendirilmiştir. Girdi değişkenlerinin kendi içlerinde yüksek bağımlılık göstermeleri nedeniyle tahmin metodolojisi olarak tek değişkenli regresyon modelleri tercih edilmiş ve basit lineer regresyon, doğrusal olmayan lineer regresyon ve Random Forest Regresyon modelleri geliştirilmiştir. Modellerin karşılaştırılması R-Squared metriği ve hata metrikleri üzerinden değerlendirilmiş, en başarılı sonuçları Random Forest Regresyon modelinin ürettiği görülmüştür.

Korelasyon analizi sonucunda girdi değişkenlerinin sayısı azaltılmış olsa da, hedef değişken verisinin kategori ve kanal çeşitlilikleri nedeniyle 100'den fazla tek değişkenli regresyon modeli eğitilmiştir. Bu modeller arasından %95 güven aralığında anlam taşıyan ve R-Squared değeri en az %60 olanlar seçilmiştir. Bütün modellerin hedef değişken tahminleri değişkenlik gösterdiği ve erken uyarı sisteminin asıl amacının satış değerinin yönünü öngörebilmek olması nedeniyle, tahmin değerinin önceki döneme göre yönü model çıktısı olarak kullanılmıştır. Modeller R-Squared ve hata değerlerine göre puanlanarak her bir satış kategorisi ve kanalı için tek bir satış değeri yönü tahmin değeri üretilmiştir. Modeller; açıklayıcılık, modelin hata değeri, bağımsız değişkenin katsayısı gibi kriterler uzman görüşüne dayalı puanlanmıştır.



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Bu çalışmada, makroekonomik göstergeler gibi dış kaynaklı verilerin satış verisi üzerindeki etkisi betimsel ve çıkarımcı istatistiksel yöntemler ile analiz edilmiştir. Sürekli eğitilen makine öğrenmesi modelleri kurularak gelecek dönem satış değerindeki dalgalanmanın yönünü tahmin edebilen bir erken uyarı sistemi geliştirilmiştir.

Anahtar: Random Forest Regresyon, Makroekonomik göstergeler, Erken uyarı sistemleri, Karar destek sistemleri

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Zeki Onur YÜKSEK¹, Ayşe SALI², Erhan ALASAR³, Şahika KOYUN YILMAZ^{4*}

¹ Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0009-0005-0508-3874, zekionur.yuksekk@metric.net,

² Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0009-0005-3512-5430, ayse.sali@metric.net,

³ Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0009-0005-9811-8764, erhan.alasar@metric.net,

⁴ Metric Bilgisayar Yazılım ve Danışmanlık, Orcid ID: 0000-0002-2589-3568, sahika.koyun@metric.net,

* Sorumlu Yazar: sahika.koyun@metric.net

Özet

Şirketlerin ana gelirini oluşturan satışların finansal veya hacimsel dalgalanmaları operasyonel karar süreçlerini olumsuz etkilemektedir. Ekonomik belirsizlik durumunun yoğun olduğu günümüz koşullarında, gelecek dönem satış değerinin yönünün tahmin edilmesiyle ilgili önlemlerin alınabilmesi veya fırsatların değerlendirilebilmesi için ön uyarı sistemlerinin geliştirilmesi önem arz etmektedir.

Döviz kuru, ÜFE, TÜFE, kredi kartı harcamaları, istihdam oranları, para arzı vb. çeşitli makroekonomik göstergelerin satış değeri üzerindeki etkisi gecikme penceresi ($t_{lag} = 0,1, \dots, 5$) dahilinde analiz edilmiştir. Geniş bir gösterge yelpazesinden ilgili bağımsız değişkenlerin seçilebilmesi için öncelikli olarak korelasyon analizi gerçekleştirilmiştir. Orta ve yüksek kuvvette korelasyon gösteren değişkenlerin VIF analizi ile bağımsızlıkları değerlendirilmiştir. Girdi değişkenlerinin kendi içlerinde yüksek bağımlılık göstermeleri nedeniyle tahmin metodolojisi olarak tek değişkenli regresyon modelleri tercih edilmiş ve basit lineer regresyon, doğrusal olmayan lineer regresyon ve Random Forest Regresyon modelleri geliştirilmiştir. Modellerin karşılaştırılması R-Squared metriği ve hata metrikleri üzerinden değerlendirilmiş, en başarılı sonuçları Random Forest Regresyon modelinin ürettiği görülmüştür.

Korelasyon analizi sonucunda girdi değişkenlerinin sayısı azaltılmış olsa da, hedef değişken verisinin kategori ve kanal çeşitlilikleri nedeniyle 100'den fazla tek değişkenli regresyon modeli eğitilmiştir. Bu modeller arasından %95 güven aralığında anlam taşıyan ve R-Squared değeri en az %60 olanlar seçilmiştir. Bütün modellerin hedef değişken tahminleri değişkenlik gösterdiği ve erken uyarı sisteminin asıl amacının satış değerinin yönünü öngörebilmek olması nedeniyle, tahmin değerinin önceki döneme göre yönü model çıktısı olarak kullanılmıştır. Modeller R-Squared ve hata değerlerine göre puanlanarak her bir satış kategorisi ve kanalı için tek bir satış değeri yönü tahmin değeri üretilmiştir. Modeller; açıklayıcılık, modelin hata değeri, bağımsız değişkenin katsayısı gibi kriterler uzman görüşüne dayalı puanlanmıştır.



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Bu çalışmada, makroekonomik göstergeler gibi dış kaynaklı verilerin satış verisi üzerindeki etkisi betimsel ve çıkarımcı istatistiksel yöntemler ile analiz edilmiştir. Sürekli eğitilen makine öğrenmesi modelleri kurularak gelecek dönem satış değerindeki dalgalanmanın yönünü tahmin edebilen bir erken uyarı sistemi geliştirilmiştir.

Anahtar: Random Forest Regresyon, Makroekonomik göstergeler, Erken uyarı sistemleri, Karar destek sistemleri

AI-Driven Personalized Well-Being Assistant - Enhancing Employee Health and Productivity through Advanced Machine Learning and NLP

Osman aylı¹, Atıncı Yılmaz²

¹ VBT Yazılım A.Ş., Orcid ID: <https://orcid.org/0009-0006-9072-9146>,

E-mail: Osman.Cayli@vbt.com.tr

² İstanbul Beykent University, Orcid ID: <https://orcid.org/0000-0003-0038-7519>,

E-mail: atincyilmaz@beykent.edu.tr

* Correspondence: Osman.Cayli@vbt.com.tr;

Abstract

In modern workplaces, the well-being of employees directly impacts organizational performance, yet traditional occupational health approaches often lack personalized, real-time support. This research presents the design of an AI-driven personalized well-being assistant that continuously analyzes users' physical and psychological health metrics through wearable technologies, mobile applications, and digital interaction logs. Leveraging advanced machine learning (ML), deep learning (DL), and natural language processing (NLP) techniques, the system delivers real-time, customized recommendations to reduce stress, improve sleep patterns, and optimize daily routines. The project employs explainable AI (XAI) principles and ensures full compliance with GDPR and KVKK regulations. Preliminary experimental framework indicates promising feasibility for improving individual quality of life while enhancing organizational productivity and employee engagement.

Keywords: Well-Being, Personalized Health, Machine Learning, Deep Learning, NLP, Explainable AI

An Industry Independent B2B Customer Valuation Model for Operational Decision Making Processes

Şahika KOYUN YILMAZ^{1*}, Alev TAŞKIN²

¹ Metric Software and Consultancy, Orcid ID: 0000-0002-2589-3568, sahika.koyun@metric.net,

² Yildiz Technical Universtiy, Orcid ID: 0000-0003-1803-9408, ataskin@yildiz.edu.tr,

* Correspondence: sahika.koyun@metric.net

Abstract

Invisible or intangible assets are resources that cannot be seen or touched but still provide value to the holder. Customers or customer portfolios are valuable intangible assets because they are expensive to develop but easy to lose. The definition of the customer is important for choosing a methodology for customer valuation. Although we say they are both customers, the customer in B2B and B2C business models vastly differentiates. They both need to be evaluated to distribute finite resources efficiently, but the methodologies should also be differentiated.

B2B relationships are typically more complex than B2C relationships. They often involve multiple stakeholders, longer sales cycles, and different marketing and sales approaches. The value of a customer in the B2B model requires information beyond transactional data. Customers do not resell the product only, but they also represent the brand values. They also create tangible and intangible values beyond finances. Traditional RFM models fall short of adequately capturing the intricate nature of B2B relationships. In this study, we propose a model capable of evaluating tangible and intangible metrics within B2B relations for customer valuation. The model establishes a template for criteria and their integration to calculate a customer value score. The change in the customer value score over time can be tracked to predict customer behaviour. It provides data-driven evaluation, creates transparency, increases accountability, and removes personal bias from operational decision processes.

Keywords: Customer Valuation, Decision Support Systems, Operational Decision Processes, Customer Behaviour

A Data Fusion Method Combining Image, Sensor, and Survey Data for Efficiency and Usability Analysis of Electric Power Tools in Industrial Environments

Kader NIKBAY OYLUM^{1*}, Turgay Tugay BILGIN²

¹ Trex Dijital Akıllı Üretim Sistemleri A.Ş., 0000-0002-5218-9218, kaderoylum@trex.com.tr

² Bursa Teknik Üniversitesi, 0000-0002-9245-5728, turgay.bilgin@btu.edu.tr

Abstract

The increasing integration of advanced technologies and automation in industrial production has heightened the importance of operational efficiency and safety. Among the critical components influencing workforce performance and product quality is the effective use of electric hand tools. However, the limited availability of comprehensive datasets and the absence of robust labeling methodologies present significant challenges for accurate data analysis and predictive modeling.

This study addresses these limitations by incorporating field-collected data and multiple data acquisition techniques to identify relevant features for machine learning applications. An initial dataset comprising 51 attributes was systematically reduced to 16 through feature selection processes, enhancing its suitability for subsequent computational modeling. Several classification algorithms were evaluated for data labeling, with the Decision Tree method demonstrating superior performance in terms of accuracy.

Despite these promising results, the dataset's limited sample size (64 individuals) restricts the generalizability and reliability of machine learning outcomes. To mitigate this constraint, data augmentation techniques will be employed to generate synthetic instances, thereby expanding the dataset. Upon achieving a sufficient sample size, machine learning models will be developed to predict individuals' proficiency with electric hand tools. This research contributes to the foundational knowledge required for efficient data collection, accurate labeling, and the development of predictive models in industrial settings.

Keywords: Data Fusion, Machine Learning, Digitization, Data Labeling, Predictive Modeling

Blockchain-Enabled Employment Contracts: Automation and Transparency in Workforce Management via Smart Contracts

Osman Çaylı¹, Atınç Yılmaz²

¹ VBT Yazılım A.Ş., Orcid ID: <https://orcid.org/0009-0006-9072-9146>,

E-mail: Osman.Cayli@vbt.com.tr

² İstanbul Beykent University, Orcid ID: <https://orcid.org/0000-0003-0038-7519>,

E-mail: atincyilmaz@beykent.edu.tr

* Correspondence: Osman.Cayli@vbt.com.tr;

Abstract

This paper explores the design and implementation of a blockchain-based smart contract framework for automating employment agreements in corporate environments. While traditional employment contract management is often burdened with manual workflows, fragmented verification mechanisms, and limited transparency, the proposed system introduces a decentralized architecture that securely stores and executes contractual obligations. By encoding employment conditions such as salary payments, overtime calculations, and compliance requirements into self-executing smart contracts, the platform eliminates intermediaries, reduces administrative costs, and mitigates human errors that frequently lead to disputes and inefficiencies.

Furthermore, the research integrates advanced Natural Language Processing (NLP) and supervised machine learning algorithms to strengthen legal compliance and proactive risk management. Using domain-specific models like Legal-BERT, the system automatically analyzes complex contractual texts, flags ambiguities, and calculates breach probabilities based on historical data patterns. This dual-layered approach—automation of execution and intelligent oversight—contributes to the evolving literature on legal technology, blockchain governance, and digital HR transformation. The expected results suggest measurable economic gains, increased trust between employers and employees, and a practical roadmap for organizations seeking to modernize their workforce management in line with GDPR and KVKK regulations.

Keywords: Blockchain, Smart Contracts, Legal Tech, Employment Contracts, HR Automation, NLP



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Analysis of Consumption Forecasting in Electrical Distribution Networks With Deep Learning

Zeki Oralhan¹, Numan Köksal²

¹ Nuh Naci Yazgan University, Orcid ID: <https://orcid.org/0000-0003-2841-6115>,
E-mail: zoralhan@nny.edu.tr

² Nuh Naci Yazgan University, E-mail: numankoksal24@gmail.com

* Correspondence: numankoksal24@gmail.com

Abstract

This study examines the use of deep learning models aimed at improving the accuracy and efficiency of energy consumption forecasts. It investigates how these techniques can be beneficial in areas such as the effective management of electricity distribution networks, integration of sustainable energy sources, and demand management. By enhancing the accuracy of electricity consumption predictions, the study offers suggestions for optimizing energy costs, increasing the use of renewable energy, and reducing energy losses. Moreover, it highlights the potential of deep learning and artificial intelligence technologies to make energy systems more efficient and sustainable. The study analyzes four popular deep learning models used in electricity consumption forecasting: Long Short-Term Memory (LSTM), Multilayer Perceptrons (MLP), Recurrent Neural Networks (RNN), Gated Recurrent Units (GRU), and the Transformer Deep Learning Model. Based on the results obtained, it was determined that the RNN model exhibited higher prediction accuracy compared to the others.

Keywords: Multilayer Perceptrons, Deep Learning, Electricity consumption, Weather, Gated Recurrent Units, Recurrent Neural Networks, Long Short-Term Memory

Mechanical and Environmental Comparison of Natural Fibers and Glass Fiber in the L-RTM Method

Nazmi Türkhan^{1*}, Kübra Tuna^{2*}, Hüseyin Arıkan^{3*}, Yusuf Uzun^{4*}

¹ Polgün Waterparks& Attractions, Orcid ID: <https://orcid.org/0009-0002-2866-6544>, E-mail: nazmi.turkhan@polgun.com

² Polgün Waterparks& Attractions, Orcid ID: <https://orcid.org/0009-0008-3538-7918>, E-mail: kubra.tuna@polgun.com

³Necmettin Erbakan University, Seydişehir Ahmet Cengiz Faculty of Engineering, Department of Mechanical Engineering Orcid ID: <https://orcid.org/0000-0003-1266-4982>, E-mail: harikan@erbakan.edu.tr

⁴Necmettin Erbakan University, Seydişehir Ahmet Cengiz Faculty of Engineering, Department of Computer Engineering Orcid ID: <https://orcid.org/0000-0002-7061-8784>, E-mail: yuzun@erbakan.edu.tr

Abstract

The applicability of flax fiber-reinforced composites as an environmentally friendly alternative to glass fiber-reinforced plastics (GFRP), commonly used in outdoor structures such as water slides, has been investigated. While glass fiber is associated with high energy consumption and significant environmental impacts, flax fiber offers a sustainable solution due to its renewable nature, low density, and biodegradable properties. The mechanical and environmental performance of flax fiber-reinforced composites manufactured using the L-RTM (Light Resin Transfer Molding) method was evaluated, with a particular focus on sensitivity to water and moisture, and design considerations to mitigate these effects were discussed. In this method, L-RTM is employed as a vacuum-assisted, closed-mold technique particularly suited for medium-scale production of high-quality components with smooth surfaces on both sides. In this context, the essential conditions for natural fiber-reinforced composites to serve as a viable alternative to glass fiber in water slide applications have been identified.

Smart Classroom Scheduling and Resource Optimization for Educational Institutions: Integrating AI and Multi-Objective Decision Support

Osman Çaylı¹, Atınç Yılmaz²

¹ VBT Yazılım A.Ş., Orcid ID: <https://orcid.org/0009-0006-9072-9146>,

E-mail: Osman.Cayli@vbt.com.tr

² İstanbul Beykent University, Orcid ID: <https://orcid.org/0000-0003-0038-7519>,

E-mail: atincyilmaz@beykent.edu.tr

* Correspondence: Osman.Cayli@vbt.com.tr;

Abstract

The demand for high-quality education delivery in increasingly dynamic and competitive educational markets has intensified the need for intelligent and adaptive scheduling systems. Manual classroom scheduling methods, which rely on human decision-making, often fail to optimize critical resources such as classrooms, teachers, and student time, leading to inefficiencies and economic losses. This paper proposes a comprehensive Smart Classroom Scheduling and Optimization System (LMSOPT) that leverages Artificial Intelligence (AI), advanced time-series forecasting, constraint-based multi-objective optimization, and real-time data integration.

The proposed system employs Long Short-Term Memory (LSTM) neural networks for highly accurate demand forecasting, alongside heuristic and metaheuristic optimization algorithms such as Constraint Programming (CP), Genetic Algorithms (GA), and Tabu Search. The system aims to dynamically balance multiple conflicting objectives: maximizing classroom occupancy rates, minimizing student waiting times, and aligning teacher availability with student preferences.

The expected contributions are multifold: significant operational cost savings, measurable improvements in resource utilization, increased student satisfaction, and the creation of an extensible research framework for AI applications in education management. The study aligns with national strategies for digital transformation and supports the vision of data-driven decision-making in educational administration. Empirical results and comparative analyses are presented to validate the system's effectiveness and demonstrate its replicability for institutions of various scales.

Keywords: Artificial Intelligence, Smart Scheduling, LSTM, Constraint Programming, Education Technology

Two-Factor Authentication System for Protecting Metadata and Connected Vehicles

Huseyin KARACALI^{1*}, Nevzat DONUM^{2*}, Efecan CEBEL^{3*}

- ¹ TTTechAuto Turkey, Software Architect, Orcid ID: <https://orcid.org/0000-0002-1433-4285>, E-mail: huseyin.karacali@tttech-auto.com
- ² TTTechAuto Turkey, Embedded Software Engineer, Orcid ID: <https://orcid.org/0000-0002-8293-8267>, E-mail: nevzat.donum@tttech-auto.com
- ³ TTTechAuto Turkey, Embedded Software Engineer, Orcid ID: <https://orcid.org/0000-0002-2027-0257>, E-mail: efecan.cebel@tttech-auto.com

Abstract

Connected vehicles are becoming increasingly common, and they store a significant amount of data about their drivers and their surroundings. This data is attractive to attackers, and there is a need for effective security measures to protect it. This study proposes a two-factor authentication (2FA) system to protect the metadata stored in connected vehicles and the vehicles themselves. The system consists of two main components: the Central Security Unit (CSU) and the AutoGuard (AG) mobile application. The CSU is integrated with the Remote Keyless Entry System (RKES), while the AG is installed on the authorized driver's phone. The 2FA process begins when the remote key is in proximity to the vehicle. This triggers the CSU, which then initiates the second authentication factor. The AG prompts the driver to enter a valid security method, such as a biometric, pattern, or PIN code. If the second authentication is successful, the AG authorizes the CSU and the vehicle doors are opened by the RKES. The driver is notified by CSU through AG if the 2FA process is unsuccessful. As a result, this system aims to protect the metadata stored in authorized users' vehicles and their vehicles from unauthorized invaders. Furthermore, it is possible to enhance the accuracy of the 2FA system by integrating the location of the phone with AG functionality into the authentication system.

Keywords: Metadata, Two-Factor Authentication, Connected Vehicles, Vehicle Security

Kardiyovasküler Hastalıkların Teşhisinde CMR Görüntüleri ve Derin Öğrenme Yaklaşımları

Gülsüm Kemerli^{1*}, Tayyip Özcan²

¹ Erciyes Üniversitesi, Nuh Naci Yazgan Üniversitesi, Orcid ID: <https://orcid.org/0000-0003-2463-641X>,
gulsum@erciyes.edu.tr,

² Erciyes Üniversitesi, Orcid ID: <https://orcid.org/0000-0002-3111-5260>, tozcan@erciyes.edu.tr,

* Sorumlu Yazar: gulsum@erciyes.edu.tr; 05309428920

Özet

Kardiyovasküler hastalıkların (KVH), dünya genelinde en önemli ölüm sebeplerinden biri olması kardiyoloji alanında Derin Öğrenme (DL) çalışmalarının son dönemlerde yoğunlaşmasına sebep olmuştur. Hastalar genellikle çabuk yorulma, diz altı ve ayak bileğinde ödem, göğüs ağrısı, nefes darlığı, çarpıntı gibi semptomlarla karşılaşır. En sık rastlanan KVH türleri arasında koroner arter hastalığı, aritmiler, doğumsal kalp kusurları, kardiyomiyopati, kalp kapak yetmezlikleri ve anjinalar yer almaktadır. Hastalıkların tanısında elektrokardiyografi (EKG), kan testleri, fiziksel muayene ve tıbbi görüntüleme yöntemleri en etkili araçlar olarak kullanılmaktadır. Son yıllarda dünyada ve ülkemizde kardiyak manyetik rezonans görüntüleme (CMRI), KVH'ların teşhisi, takibi, tedavi planlaması ve prognozu açısından giderek daha fazla kullanılmaya başlanmıştır. Ancak CMRI verilerinin çok sayıda dilim içermesi ve kontrastlarının düşük olabilmesi KVH tanısını zorlaştırmaktadır. Bu zorlukları aşmak için de derin öğrenme teknikleri CMRI verileriyle KVH teşhisinde uygulanmakta ve bu alanda yoğun araştırmalar yapılmaya devam etmektedir. Derin öğrenme yaklaşımlarından; CNN tabanlı sınıflandırma ve segmentasyon ağları; 2D-CNN, 3D-CNN, U-Net, FCN, RNN ve GAN destekli veri artırma yöntemleri olarak karşımıza çıkmaktadır. Aynı zamanda kalp hastalığının teşhisi için AEs ve CNN-AEs modelleri de mevcut çalışmalarda oldukça çok kullanılan derin öğrenme mimarileri arasındadırlar. KVH tanısı için geliştirilecek derin öğrenme temelli sistemler ile tıp uzmanlarına kardiyovasküler hastalıkların teşhis edilmesinden prognoza kadar birçok aşamada yüksek performanslı gerçek yazılımların geliştirilmesine yol açabilecektir.

Anahtar: Yapay zeka, derin öğrenme, sinir ağları, sınıflandırma, kalp hastalıkları, CMRI, KVH

CMR Imaging and Deep Learning Approaches in the Diagnosis of Cardiovascular Diseases

Gülsüm Kemerli^{1*}, Tayyip Özcan²

¹ Erciyes University, Nuh Naci Yazgan University, Orcid ID: <https://orcid.org/0000-0003-2463-641X>,
gulsum@erciyes.edu.tr,

² Erciyes University, Orcid ID: <https://orcid.org/0000-0002-3111-5260>, tozcan@erciyes.edu.tr,

* Sorumlu Yazar: gulsum@erciyes.edu.tr; 05309428920

Abstract

Cardiovascular diseases (CVD) being one of the leading causes of death worldwide has led to an increase in Deep Learning (DL) studies in the field of cardiology in recent years. Patients often experience symptoms such as rapid fatigue, swelling in the lower legs and ankles, chest pain, shortness of breath, and palpitations. The most common types of CVD include coronary artery disease, arrhythmias, congenital heart defects, cardiomyopathy, heart valve insufficiency, and angina. Electrocardiography (ECG), blood tests, physical examination, and medical imaging methods are the most effective tools used in the diagnosis of these diseases. In recent years, cardiac magnetic resonance imaging (CMRI) has been increasingly used worldwide and in our country for the diagnosis, follow-up, treatment planning, and prognosis of CVD. However, the large number of slices and low contrast of CMRI data make CVD diagnosis difficult. To overcome these challenges, deep learning techniques are being applied to CMRI data for CHD diagnosis, and intensive research in this area continues. Among deep learning approaches, CNN-based classification and segmentation networks, 2D-CNN, 3D-CNN, U-Net, FCN, RNN, and GAN-supported data augmentation methods are prominent. At the same time, AEs and CNN-AEs models are among the most widely used deep learning architectures in current studies for the diagnosis of heart disease. Deep learning-based systems developed for CHD diagnosis will enable the development of high-performance real-world software for medical professionals in many stages, from the diagnosis of cardiovascular diseases to prognosis

Keywords: Artificial intelligence, deep learning, neural networks, classification, heart diseases, CMRI, CVD



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Predicting Winter Tyre Buyers Using Unsupervised Anomaly Detection Models: A Case Study in Imbalanced Learning

Selçuk Bayracı^{1*}, Garen Bozoğlanoğlu²

¹ Borusan Otomotiv, Orcid ID: <https://orcid.org/0000-0003-4831-4802>,
selcuk.bayraci@borusanotomotiv.com,

² Borusan Otomotiv, garen.bozoglanoglu@borusanotomotiv.com

* Sorumlu Yazar: selcuk.bayraci @borusanotomotiv.com

Abstract

In the automotive aftersales domain, targeted marketing and demand forecasting for seasonal products such as winter tyres are critical for optimizing operations and enhancing customer engagement. However, accurately identifying potential buyers of winter tyres remains a challenging task due to the significant class imbalance—only 1.6% of customers typically purchase winter tyres. Conventional supervised machine learning models often struggle in such settings, failing to generalize well due to the lack of positive class samples. To address this challenge, we investigate the efficacy of unsupervised anomaly detection models—One-Class Support Vector Machine (OCSVM), Local Outlier Factor (LOF), and Isolation Forest (iForest)—for identifying likely winter tyre purchasers from historical service and purchase data.

Our approach is grounded in the hypothesis that winter tyre buyers exhibit distinguishable behavioral or transactional patterns compared to the general customer population, making them amenable to detection via outlier detection algorithms. This study is conducted within the data analytics department of Borusan Otomotiv and is part of a larger initiative to apply advanced machine learning techniques for personalized automotive aftersales strategies.

The dataset comprises customer service history, vehicle information, past purchases, service invoice attributes, and geographical and seasonal features from Borusan Otomotiv's CRM and DMS systems, spanning multiple years. The target variable is binary—whether the customer purchased winter tyres within the given season (1) or not (0). Given the extremely low prevalence (1.6%), the dataset is highly imbalanced.

We implemented and tuned three unsupervised anomaly detection algorithms: One-Class SVM, Local Outlier Factor and Isolation Forest. Models were evaluated on a hold-out test set with



known labels, despite being trained unsupervised, using metrics appropriate for imbalanced settings: Precision, ROC-AUC, and PR-AUC.

Keywords: Artificial intelligence, Winter Tyre, Automotive, OCSVM, LOF, iForest



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