A I U STOMATOLOGIJI: MOGUĆNOSTI I IZAZOVI

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Computer Vision and Internet of Things

Technologies and Applications

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A CHAPMAN & HALL BOOK

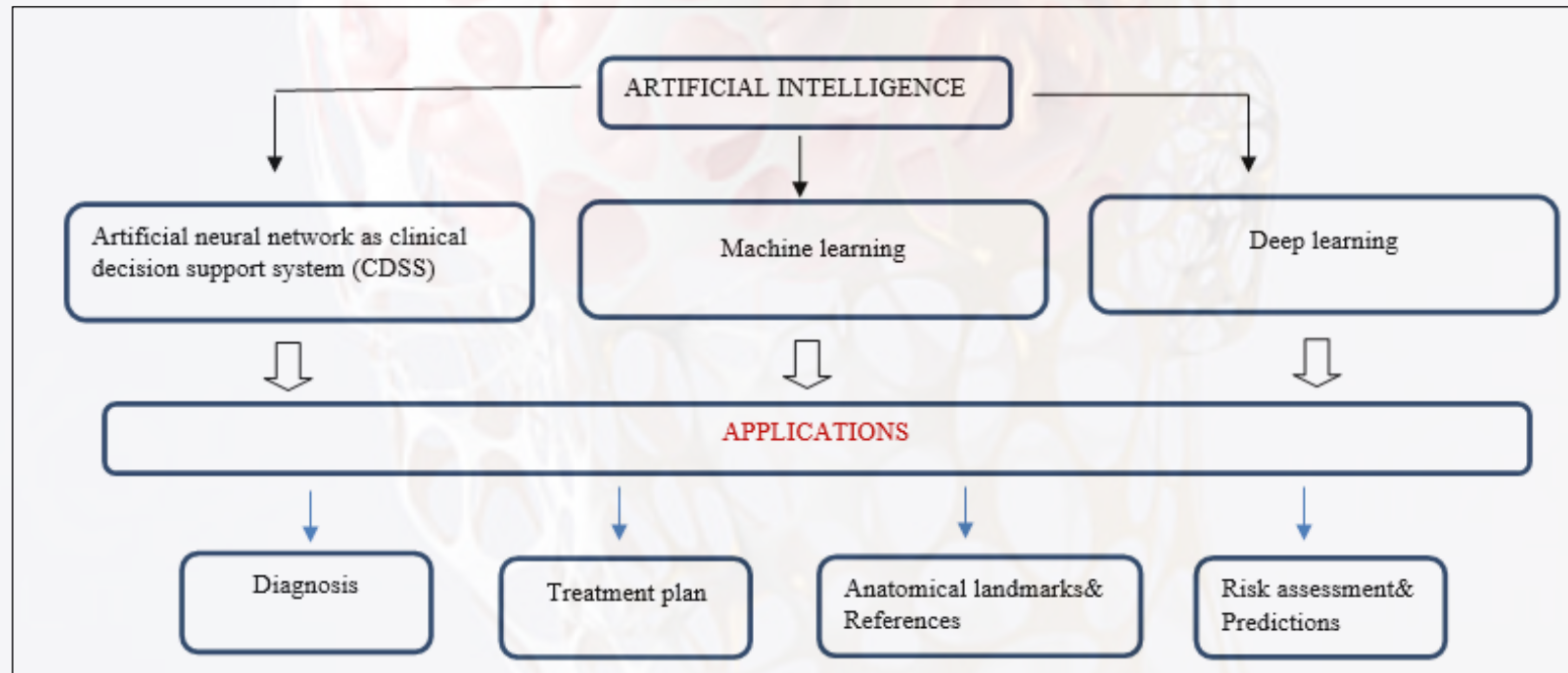# AI U STOMATOLOGIJI: MOGUĆNOSTI I IZAZOVI

dr Marija Živković

1. DIGITALNA STOMATOLOGIJA

2. AI U STOMATOLOGIJI

3. AI U ORTODONCIJI

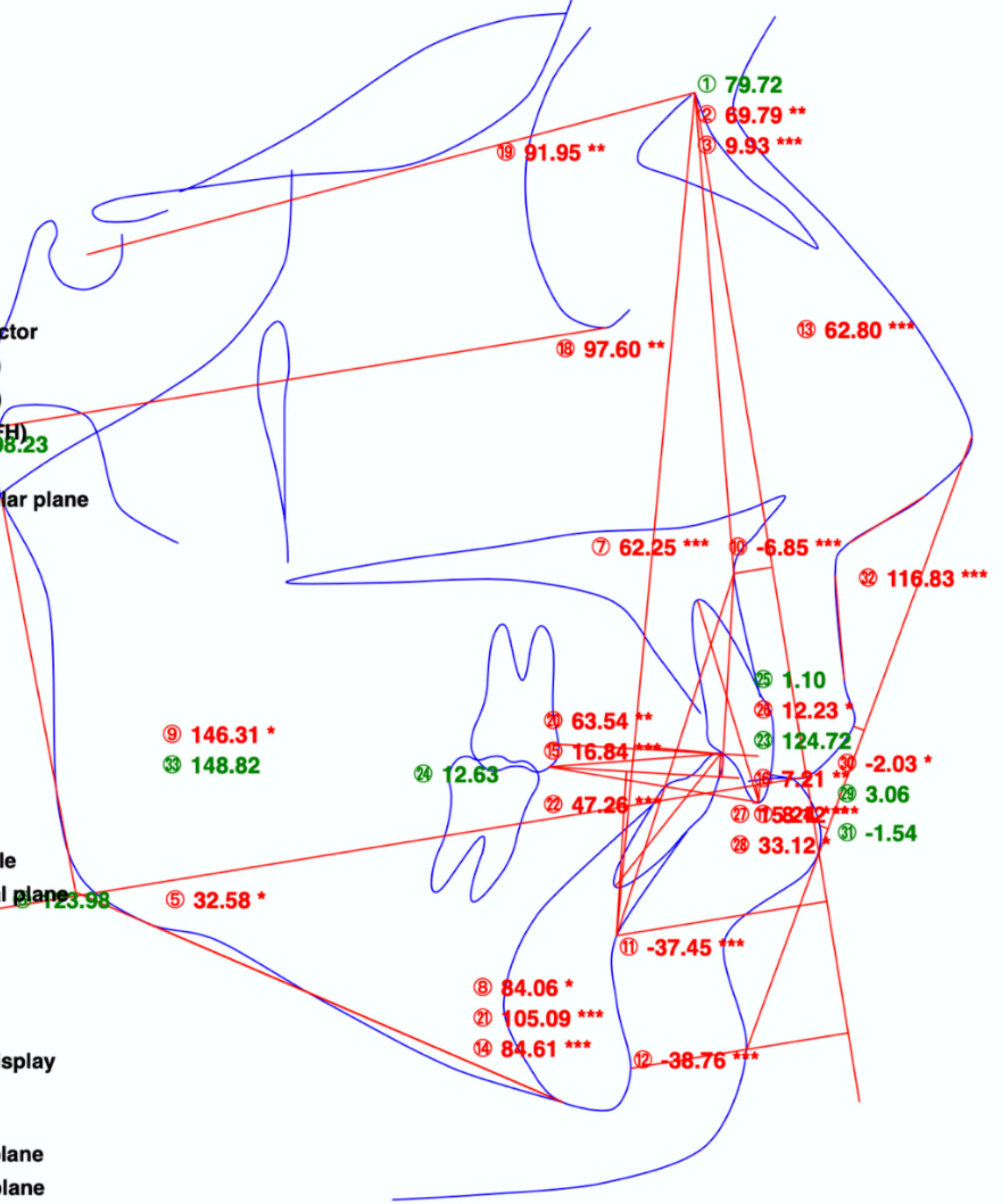# Artificial intelligence in dental practice: a review

KEFALOMETRIJSKA ANALIZA

SKELETAL

① SNA
② SNB
③ ANB
④ Bjork sum
⑤ FMA
⑥ Gonial angle
⑦ APDI
⑧ ODI
⑨ Combination factor
⑩ A to N-Perp(FH)
⑪ B to N-Perp(FH)
⑫ Pog to N-Perp(FH)
⑬ FH to AB
⑭ A-B to mandibular plane
⑮ Wits appraisal

DENTAL

⑯ Overjet
⑰ Overbite
⑱ U1 to FH
⑲ U1 to SN
⑳ U1 to UOP
㉑ IMPA
㉒ L1 to LOP
㉓ Interincisal angle
㉔ Cant of occlusal plane
㉕ U1 to NA(mm)
㉖ U1 to NA(deg)
㉗ L1 to NB(mm)
㉘ L1 to NB(deg)
㉙ Upper incisal display

SOFT-TISSUE

㉚ Upper lip to E-plane
㉛ Lower lip to E-plane
㉜ Nasolabial angle
㉝ Extraction Index

① 79.72
② 69.79 **
③ 9.93 ***
④ 398.23
⑤ 32.58 *
⑦ 62.25 ***
⑧ 84.06 *
⑨ 146.31 *
⑩ -6.85 ***
⑪ -37.45 ***
⑫ -38.76 ***
⑬ 62.80 ***
⑭ 84.61 ***
⑮ 16.84 ***
⑱ 97.60 **
⑲ 91.95 **
⑳ 63.54 **
㉑ 105.09 ***
㉒ 47.26 ***
㉓ 124.72
㉔ 12.63
㉕ 1.10
㉖ 12.23 *
㉗ 158 ***
㉘ 33.12 *
㉙ 3.06
㉚ -2.03 *
㉛ -1.54
㉜ 116.83 ***
㉝ 148.82
123.98
-7.21 **

ODREĐIVANJE SKELETNE ZRELOSTI / CVM

Schematic representation	CS 1	CS 2	CS 3	CS 4	CS 5	CS 6
Inferior borders of C2, C3, and C4[a]	F, F, F	C, F, F	C, C, F	C, C, C	C, C, C	C, C, C
C3 morphology[a]	T	T	T	RH	S/RH	RV/RH
C4 morphology[a]	T	T	T/RH	RH	S/RH	RV/RH
Clinical implication	Prepubertal stage	Prepubertal ("get-ready") stage	Circumpubertal stage	Circumpubertal stage	Postpubertal stage	Postpubertal stage

[a] F= Flat; C= Concavity; T= Trapezoid; RH=Rectangular Horizontal; S=Square; RV=Rectangular Vertical

Skeletal age, which can be assessed using cervical vertebral maturation (CVM) or wrist X-rays, is a more suitable parameter for evaluating individual growth [90,96–99]. While wrist X-rays are contraindicated in standard diagnostic orthodontic routines, the CVM can be assessed using lateral cephalometric X-rays [33]. In recent years, there has been a growing body of scientific evidence supporting the diagnostic accuracy and effectiveness of AI in assessing skeletal age based on both wrist X-rays and CVM [100–105]. Despite the proven diagnostic accuracy of AI in skeletal age assessment, particularly with wrist X-rays and even index finger X-rays, concerns remain regarding the accuracy of CVM-based models [106,107]. Studies on this topic have yielded varied results, with agreement rates with human observers ranging from 58% to more than 90% [107–112]. Seo et al. (2021) reported that CNN-based models achieved more than 90% accuracy in CVM assessments, suggesting that automatic diagnosis using lateral cephalometric radiographs can accurately determine skeletal maturity [109]. However, exercise caution is important when evaluating the results of AI in CVM assessments. Other studies have reported notable discrepancies, particularly during crucial orthodontic treatment stages around the growth peak, when accuracy tends to decrease [95,110].

ODLUKA O EKSTRAKCIJAMA
ZUBA

Can we predict orthodontic extraction patterns by using machine learning?

Landon Leavitt[1] | James Volovic[1] | Lily Steinhauer[2] | Taylor Mason[1] | George Eckert[3] | Jeffrey A. Dean[4] | M. Murat Dundar[5] | Hakan Turkkahraman[1]

5 | CONCLUSIONS

All tested supervised ML techniques yielded good accuracy in predicting U/L4s and U4s extraction patterns. However, due to the small sample sizes and the borderline cases, they predicted poorly for the U4/L5s, U5/L4s, and U/L5s extraction patterns. Right and left molar relationship, mandibular crowding, and overjet were found to be the most predictive indicators for determining extraction patterns. Future studies with greater sample sizes in each extraction pattern and a consensus reached by multiple clinicians in determining extraction patterns are expected to improve the accuracy of the predictions.

Review

AI in Orthodontics: Revolutionizing Diagnostics and Treatment Planning—A Comprehensive Review

Natalia Kazimierczak [1,†], Wojciech Kazimierczak [1,2,*,†], Zbigniew Serafin [2], Paweł Nowicki [1], Jakub Nożewski [3] and Joanna Janiszewska-Olszowska [4]

Several AI tools have been introduced in recent years to support therapeutic decision making in orthodontics [94,138,139]. Initial studies on extraction decision aids have shown promising results, with AI algorithms achieving over 80% agreement with expert decisions [140–144]. Xie's study (2010) [144] revealed an 80% concurrence in extraction decisions between AI and experts, although only 20 cases were analyzed. Jung and King evaluated an ANN system [142], which achieved a 93% success rate in diagnosing extraction versus nonextraction cases based on 12 cephalometric variables and an 84% success rate for the detailed diagnosis of specific extraction patterns.

ALIGNER PLANNING

1. Planiranje terapije

2. Prilagodjavanje terapije svakom pacijentu

3. Simulacija krajnjeg rezultata

4. Efikasnost/Tačnost

5. Prediktivna analiza

Effectiveness of clear aligner therapy for orthodontic treatment: A systematic review

Lindsay Robertson, Harsimrat Kaur, Nathalia Carolina Fernandes Fagundes, Dan Romanyk, Paul Major, Carlos Flores Mir ✉

Conclusions

'Low to moderate level' of certainty in regard to specific clear aligner therapy tooth movements' efficiency was identified. Clear aligners may produce clinically acceptable outcomes that could be comparable to fixed appliance therapy for buccolingual inclination of upper and lower incisors in mild to moderate malocclusions. However, not all potential clinical scenarios have been assessed in the included studies. Most of the tooth movements may not be predictable enough to be accomplished with only one set of trays with clear aligners despite the recent advances in technology.

A comparison of treatment effectiveness between clear aligner and fixed appliance therapies

Yunyan Ke[1†], Yanfei Zhu[2*†] and Min Zhu[2,3*] ⓘ

Conclusions

The similar overall improvement in OGS scores indicated that both clear aligners and braces were effective in treating malocclusion. Clear aligners had advantage in segmented movement of teeth and shortening treatment duration. While braces were more effective in achieving great improvement, producing adequate occlusal contacts, controlling teeth torque, increasing transverse width and retention than aligners. Therefore, clinicians should consider the characteristics of these two orthodontic appliances when making treatment decision.

ZAKLJUČAK
A I U STOMATOLOGIJI

- Budućnost definitivno, ali već i deo našeg svakodnevnog rada

- Značajno unapredjuje dijagnostičku proceduru

- Pomaže da budemo efikasniji i brži u svom poslu

- Potrebno više edukacije na temu digitalnih tehnologija i AI u stomatološkoj praksi

- Da li će nas AI u bliskoj budućnosti zameniti?
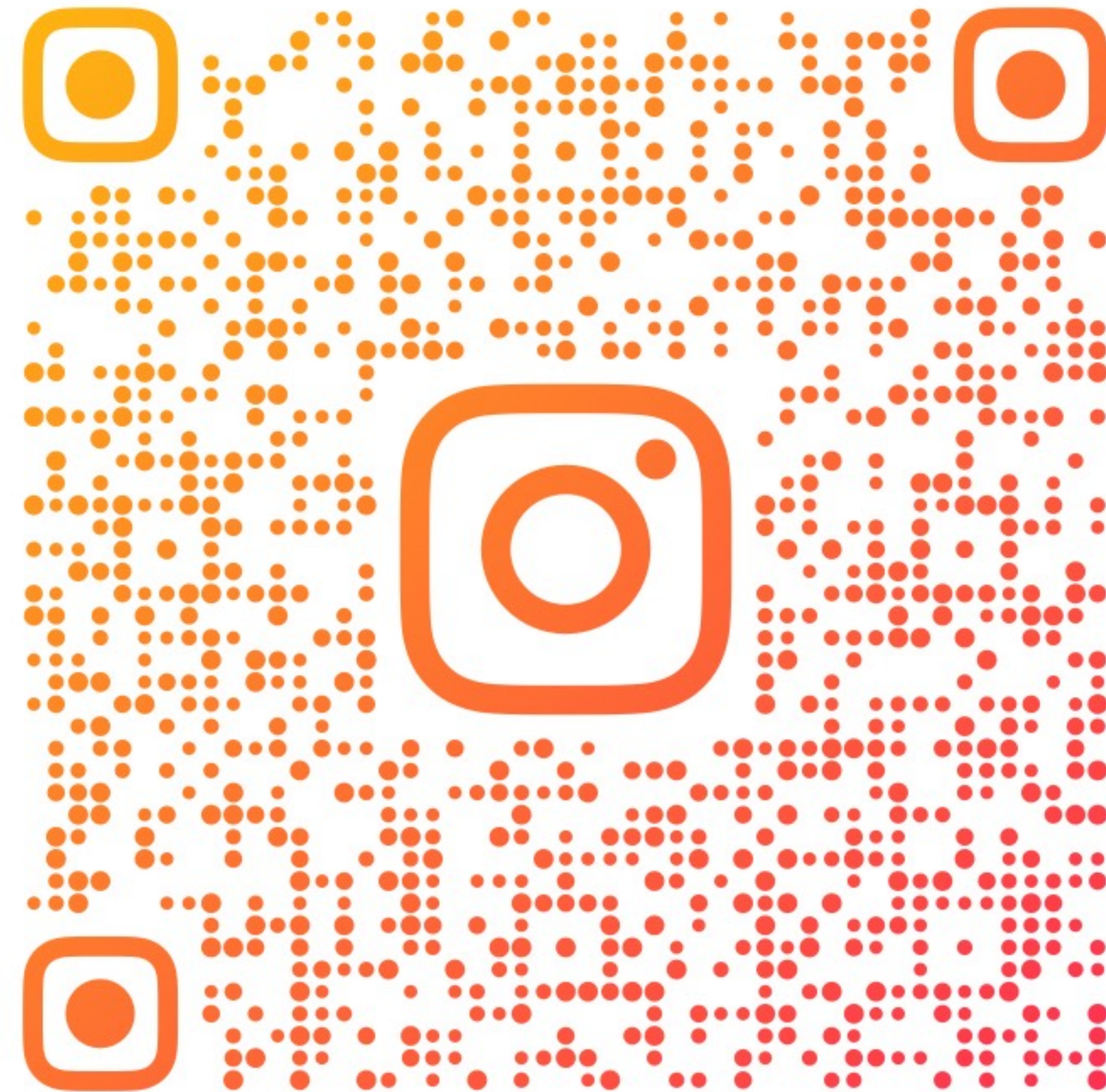
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