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## Intelligent Information Processing Laboratory

Prof. Xian-Da Zhang

[zxd-dau@tsinghua.edu.cn](mailto:zxd-dau@tsinghua.edu.cn)

Tsinghua National Laboratory for Information Science and Technology



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# Introduction

## Affiliation

- Computer Science and Artificial Intelligent (CSAI) Division, Tsinghua National Laboratory for Information Science and Technology (TNList)
- Department of Automation

## Faculty

- **Prof. Xian-Da Zhang:** Supervising the Intelligent Information Processing Lab
- **Associate Prof. Hong-Xing Zou**
- **Associate Prof. Qing Zhuo**

## Staff/Students

- 1 Postdoctoral fellow
- 14 Ph. D candidates
- 6 master candidates



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## Objectives

Develop advanced theories  
and algorithms in signal  
and information processing

**Intelligent  
Signal  
Processing**

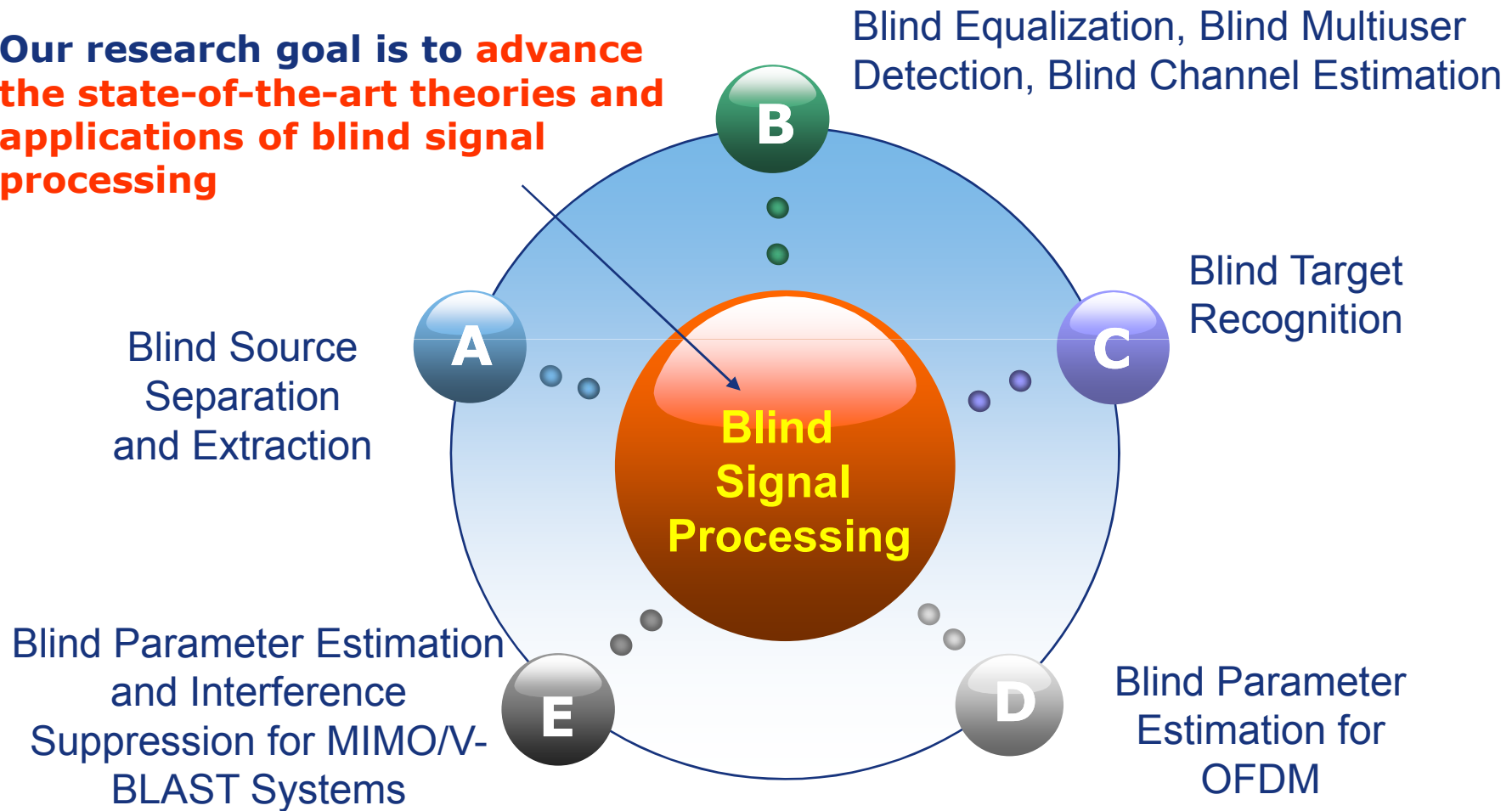
Provide technological support  
and consultation for national  
and industrial applications

Foster inter-disciplinary research and  
education for undergraduate and  
graduate students together with  
postdoctoral fellows



## Research Directions (1)

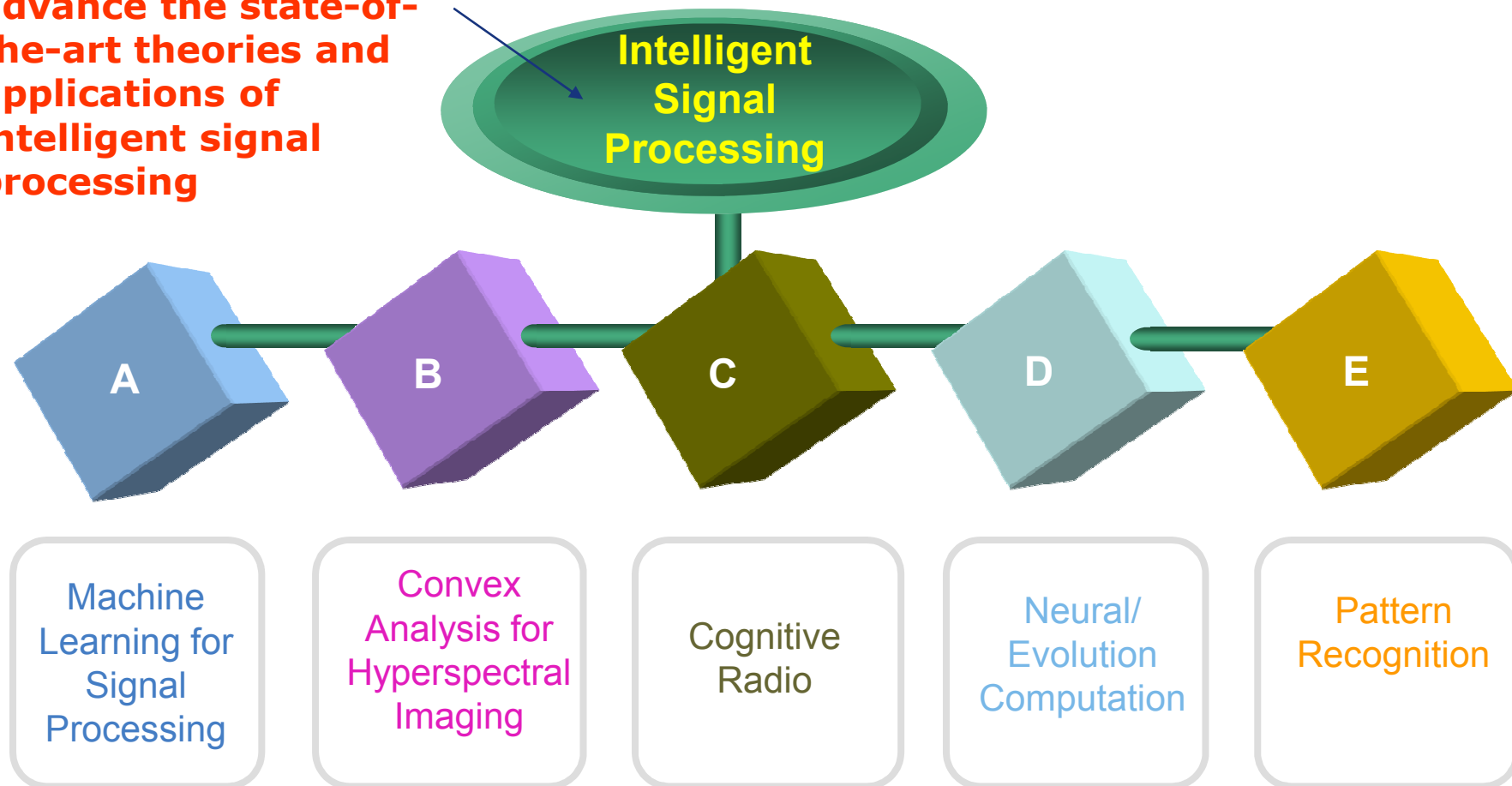
Our research goal is to **advance the state-of-the-art theories and applications of blind signal processing**





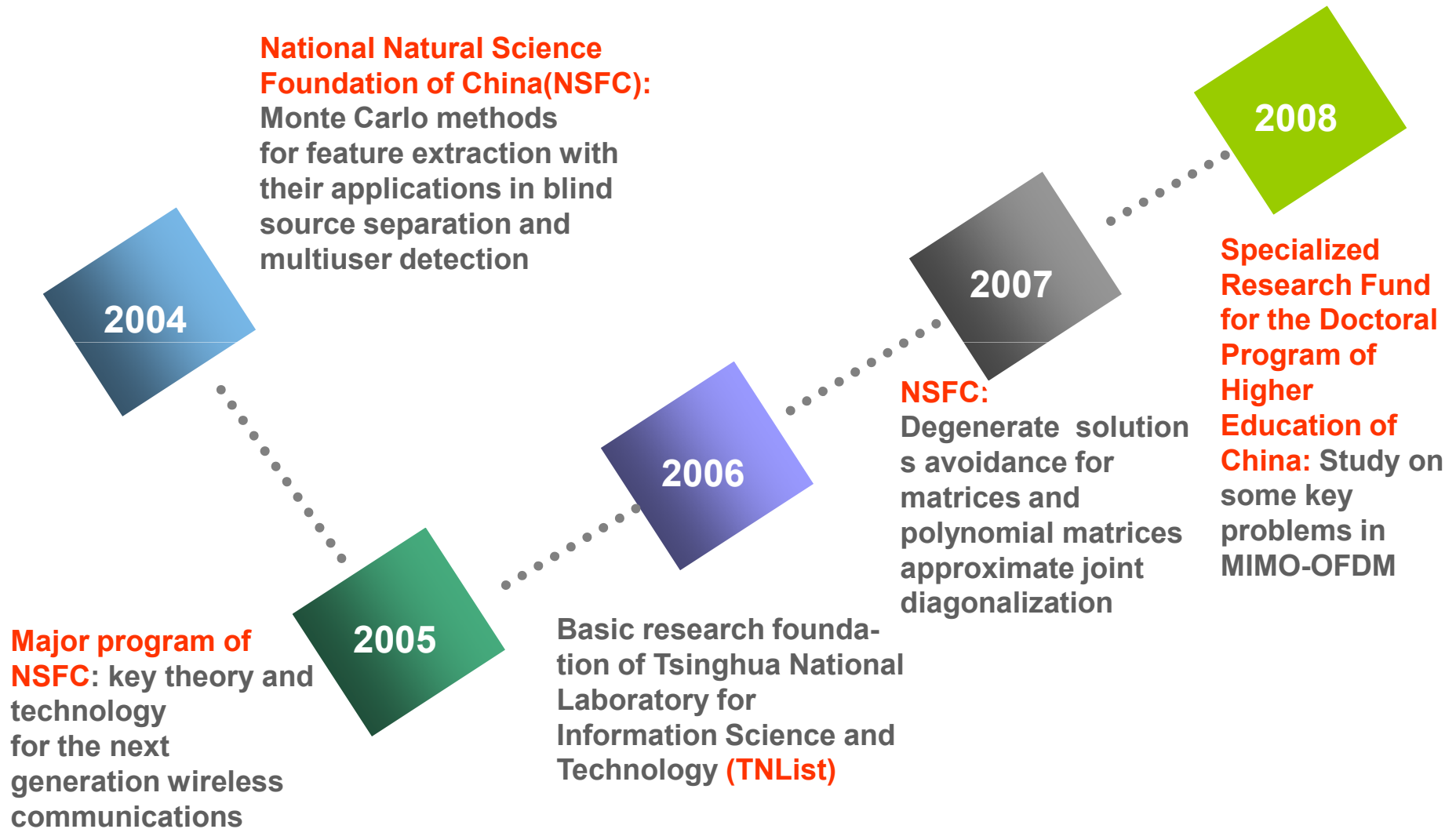
## Research Directions (2)

Our research goal is to advance the state-of-the-art theories and applications of intelligent signal processing





## Recent Research Projects





## Publications in recent 3 years (1)

### IEEE Transactions and Journals:

- [1] Fang-Ming Han and Xian-Da Zhang, “MLSD for hexagonal multicarrier transmission with time-frequency localized pulses,” *IEEE Trans. Vehicular Technology*, vol. 58, no. 2, Mar. 2009.
- [2] Feng Zhu, Xian-Da Zhang et. Al., “A Gabor filter approach to joint feature extraction and target recognition for high-resolution radar range profile,” (Regular Paper) *IEEE Trans. Aerospace Electronic and Systems*, to appear.
- [3] Qiubin Gao, Xian-Da Zhang, Jian Li and Wei Shi, “Linear precoding and finite rate feedback design for V-BLAST architecture,” (Regular Paper) *IEEE Trans. Wireless Commun.*, to appear.
- [4] Li Zhang, Xian-Da Zhang and Qiubin Gao, “Performance analysis of universal distributed estimation in bandwidth-constrained sensor networks,” *IEEE Signal Processing Letters* , vol. 15, pp. 473-476, 2008.
- [5] J. Li and X. -D. Zhang, “Hybrid iterative decoding for low-density parity-check codes based on finite geometries,” *IEEE Communications Letters*, vol. 12, no.1, pp. 29-31, Jan. 2008.
- [6] J. Li and X. -D. Zhang, Norman C. Beaulieu, “Precise calculation of the SEP of 128- and 512-cross-QAM in AWGN,” *IEEE Communications Letters*, vol. 12, no.1, pp. 1-3, Jan. 2008.



## Publications in recent 3 years (2)

- [7] Qiubin Gao, Xian-Da Zhang and Jian Li, “Power control of V-BLAST system with per-antenna power constraints,” *IEEE Communications Letters*, vol. 11, no. 11, pp. 833- 835, Nov. 2007.
- [8] Wei Shi and Xian-Da Zhang, “A Bayesian robust adaptive beamforming based on phase-invariant MMSE criterion,” *IEEE Signal Processing Letters*, vol. 14, no. 7, pp. 465-468, July 2007.
- [9] Ling Zhang and Xian-Da Zhang, “An Optimal Filtering Algorithm for Systems with Multiplicative/Additive Noises,” *IEEE Signal Processing Letters*, vol. 14, no. 7, pp. 469-472, July 2007.
- [10] Fang-Ming Han and Xian-Da Zhang, “Hexagonal multicarrier modulation: A robust transmission scheme for time-frequency dispersive channels,” *IEEE Trans. Signal Processing*, vol. 55, no. 5, pp. 1955-1961, May 2007 .
- [11] Xi-Lin Li and Xian-Da Zhang, “Non-orthogonal joint diagonalization free of degenerate solution,” *IEEE Trans. Signal Processing*, vol. 55, no. 5, pp. 1803-1814, May 2007.
- [12] Feng Zhu, Xian-Da Zhang, Ya-Feng Hu and Deguang Xie, “Nonstationary hidden Markov models for multiaspect discriminant feature extraction from radar targets,” *IEEE Trans. Signal Processing*, vol. 55, no. 5, pp. 2203-2214, May 2007.



## Publications in recent 3 years (3)

- [13] Zi-Zhe Ding, Xian-Da Zhang and Xiao-Long Zhu, “A low-complexity RLS-PASTd algorithm for blind multiuser detection in dispersive CDMA channels,” *IEEE Trans. Wireless Communications*, vol. 6, no. 4, pp. 1187-1192, Apr. 2007.
- [14] Zi-Zhe Ding and Xian-Da Zhang, “Performance analysis of a nested RLS-type interference suppression algorithm for CDMA systems in dispersive channels,” *IEEE Signal Processing Letters*, vol. 14, no. 1, pp. 1-4, Jan. 2007.
- [15] Xi-Lin Li and Xian-Da Zhang, “Sequential blind extraction adopting second-order statistics,” *IEEE Signal Processing Letters*, vol. 14, no. 1, pp. 58-61, Jan. 2007 .
- [16] Yong-Tao Su, Xian-Da Zhang and Xiao long Zhu, “A low-complexity sequential Monte Carlo algorithm for blind detection in MIMO systems,” *IEEE Trans. Signal Processing*, vol. 54, no. 7, pp. 2485- 2496, July 2006 .
- [17] Xi-Lin Li and Xian-Da Zhang, “A family of generalized constant modulus algorithms for blind equalization,” *IEEE Trans. Communications*, vol.54, no.11, pp.1913-1917, 2006.
- [18] Xiao-Long Zhu, Xian-Da Zhang, Di-Zhe Ding and Ying Jia, “Adaptive non-linear PCA algorithms for blind source separation without prewhitening”, *IEEE Trans. Circuits and Systems Part I: Regular Papers* , vol. 53, no. 3, pp. 745-753, 2006 .



## Publications in recent 3 years (4)

- [19] Yu-Hang Wang, Xian-Da Zhang and He Huang, “Minimum probability of error-based adaptive multiuser decision feedback detection,” *IEEE Signal Processing Letters*, vol.13, no.5, pp.257-260, 2006.
- [20] He Huang, Xian-Da Zhang, Yu-Hang Wang and Hong-Xing Zhou, “Totally blind direct symbol estimation for zero padding OFDM in rapid channel variation cases,” *IEEE Signal Processing Letters*, vol. 13, no. 5, pp. 277-280, 2006 .
- [21] Qi Lv and Xian-Da Zhang, “A unified method for blind separation of sparse sources with unknown source number,” *IEEE Signal Processing Letters*, vol. 13, no. 1, pp. 49-51, 2006.



## Publications in recent 3 years (5)

### Other famous journals :

- [1] J. Li and X. -D. Zhang, “Equivalence of zero-forcing detector and oblique pro-projector,” *Electro. Lett.*, vol. 44, pp. 425-427, April 2008.
- [2] J. Li and X. -D. Zhang, “Reduced-complexity belief propagation decoding for low density parity check codes,” *Electro. Lett.*, vol. 44, pp. 221-222, Jan. 2008.
- [3] Qiubin Gao and Xian-Da Zhang, “Maximizing the minimum SINR of V-BLAST system,” *Signal Processing*, vol. 88, no. 4, pp. 1046-1052, 2008.
- [4] Xiaolong Zhu, Xianda Zhang and Yongtao Su, “A fast NPCA algorithm for online blind source separation” , *Neurocomputing*, Vol. 69, pp.964-968, 2006.
- [5] Xiao-Long Zhu, Xian-Da Zhang and Ji-Min Ye, “A generalized contrast function and stability analysis for overdetermined blind separation of instantaneous mixtures,” *Neural Computation*, Vol. 18, no. 3, pp. 709-728, March 2006.



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**Thank You !**