

# Curriculum Vitae and List of Publications

Koby Todros

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## Personal details:

**Name:** Koby Todros, **Academic degree:** Ph.D.

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## Education:

### **B.Sc.**

1996-2000 - Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

Graduate project: "Classification and segmentation of ECG beats using HMM".

Supervisor: Prof. Arnon Cohen (RIP).

### **M.Sc.** (Summa cum laude)

2002-2006 - Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

Thesis: "Maximum Likelihood Based Techniques for Blind Source Separation and Approximate Joint Diagonalization".

Supervisor: Prof. Joseph Tabrikian.

### **Ph.D.** (Summa cum laude)

2007-2010 - Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, 84105, Israel.

Thesis: "New Classes of Performance Lower Bounds for Parameter Estimation".

Supervisor: Prof. Joseph Tabrikian.

## Employment History:

Since 2017 - Senior Lecturer (tenured), Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

2013 - 2017 - Lecturer, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

2012 - Post doctoral fellow, Dept. of Electrical Engineering - Systems, Tel-Aviv University, Israel.

2010-2012 - Post doctoral fellow, Dept. of Electrical Engineering and Computer Science, University of Michigan, MI, U.S.A.

2007-2010 - Teaching assistant, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

2006-2007 - Consultant, EarlySense, LTD.

2004-2006 - Algorithm group manager, WideMed, LTD.

2000-2004 - Senior signal processing algorithm engineer, WideMed, LTD.

## **Professional activities:**

### **(a) Positions in academic administration:**

Since 2018 - Undergraduate acceptance committee member, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev.

Since 2018 - Graduate teaching committee member, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev.

Since 2017 - Academic in charge of the signal and image processing lab, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev.

Since 2015 - Math studies coordinator, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev.

2014-2015 - Seminar committee member, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev.

### **(b) Professional functions outside the University:**

Since December 2020 - Associate editor in the IEEE Signal Processing Letters.

2021 - Session chair: IEEE International Conference on Acoustics, Speech, and Signal Processing.

2019 - Technical program committee member: IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing.

2018 - Session chair: IEEE International Conference on Acoustics, Speech, and Signal Processing.

2017 - Committee member in a well-respected research foundation.

2016 - Organizing committee member: Radar Symposium 2017.

2015 - Organizing committee member: Radar Symposium 2016.

2012 - Technical program committee member: IEEE Statistical Signal Processing Workshop.

Since 2007 - Reviewer in the IEEE Transactions on Signal Processing, IEEE Signal Processing Letters, IEEE Transactions on Information Theory, and the Signal Processing journal.

**(c) Membership in professional societies:**

Since 2006 - IEEE Signal Processing Society, current rank: Senior member.

**Educational activities:**

**(a) Courses:**

1. “Digital signal processing” - Undergraduate.
2. “Adaptive signal processing” - Graduate.
3. “Random processes” - Graduate.
4. “Topics in multivariate statistical data analysis” - Graduate.

**(b) Research students:**

1. Nir Halay, M.Sc. student, 2015-2017, Thesis title: “Detection and localization under transformed probability measures”.
2. Yoni Eder, M.Sc. student, 2018-2020, Thesis title: “Measure-transformed two-sample Hotelling test”.
3. Yair Sorek, M.Sc. student, 2018-2020, Thesis title: “Measure-transformed Hadamard ratio test”.
4. Nadav Yazdi, M.Sc. student, 2019-2021. Thesis title: “Measure-transformed MVDR beamforming”.
5. Tal Edvabsky, M.Sc. student, 2019-2021. Thesis title: “Computationally efficient Compton imaging via parameter estimation of a low-dimensional source intensity model”.
6. Talia Ben-Guy, direct track M.Sc. student, Starting date: Sep. 2019. Thesis title: “Robust measure-transformed independent component analysis”.
7. Yair Sorek, Ph.D. student, Starting date: Oct. 2020, Thesis title: “Robust parameter estimation via the  $\mathcal{K}$ -divergence”.
8. Ori Kenig, M.Sc. student, Starting date: Oct. 2021.

### (c) Undergraduate project students:

1. Ilia Benkovitch, Oct. 2018, Project title: “Learning algorithm for transmitter localization in non-Gaussian noise”.
2. Nadav Amram, Oct. 2018, Project title: “Learning algorithm for signal detection in non-Gaussian noise”.
3. Avraham Aton, Oct. 2018, Project title: “Learning algorithm for signal detection in non-Gaussian noise”.

### Awards:

1. 2017 - **Certificate of Distinction in Teaching**, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.
2. 2010 - **Certificate of Distinction in Teaching Assistance**, Dept. of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.
3. 2010 - **Paper Award Finalist** (first author) - *IEEE International Symposium on Information Theory*, Austin, Texas, June 2010.
4. 2010 - **Travel Grant Award** - *IEEE International Symposium on Information Theory*, Austin, Texas, June 2010.
5. 2009 - **Lev-Zion Fellowship Award** for excellent doctoral students.
6. 2007 - **Pharan Fellowship Award** for excellent doctoral students.

### Scientific Publications:

#### Refereed papers in scientific journals:

1. S.D. Pittman, M. M. MacDonald, R.B. Fogel, A. Malhotra, **K. Todros**, B. Levy, A. Geva, and D. P. White, “Assessment of automated scoring of polysomnographic recordings in population with suspected sleep-disordered breathing,” *Sleep*, vol. 27, no. 7, pp. 1394-1403, Nov. 2004.
2. **K. Todros** and J. Tabrikian, “Blind separation of independent sources using Gaussian mixture model,” *IEEE Trans. on Signal Processing*, vol. 55, no. 7, pp. 3645-3658, July 2007.
3. **K. Todros** and J. Tabrikian, “QML-Based Joint Diagonalization of Positive-Definite Hermitian Matrices,” *IEEE Trans. Signal Processing*, vol. 56, no. 9, pp. 4656-4673, Sept. 2010.
4. **K. Todros** and J. Tabrikian, “General classes of performance lower bounds for parameter estimation - Part I: non-Bayesian bounds for unbiased estimators,” *IEEE Trans. Information Theory*, vol. 56, no. 10, pp. 5045-5063, Oct. 2010.

5. **K. Todros** and J. Tabrikian, "General classes of performance lower bounds for parameter estimation - Part II: Bayesian bounds," *IEEE Trans. Information Theory*, vol. 56, no. 10, pp. 5064-5082, Oct. 2010.
6. **K. Todros** and J. Tabrikian, "Uniformly best biased estimators in non-Bayesian parameter estimation," *IEEE Trans. Information Theory*, vol. 57, no. 11, pp. 7635-7647, Nov. 2011.
7. **K. Todros** and A. O. Hero, "On measure-transformed canonical correlation analysis," *IEEE Trans. Signal Processing*, vol. 60, no. 9, pp. 4570-4585, Sept. 2012.
8. **K. Todros** and A. O. Hero, "Robust multiple signal classification via probability measure-transformation," *IEEE Trans. Signal Processing*, vol. 63, no. 5, pp. 1156-1170, Jan. 2015.
9. **K. Todros**, R. Winik, and J. Tabrikian, "On the limitations of Barankin type bounds for MLE threshold prediction," *Signal Processing*, vol. 108, pp. 622-627, Mar. 2015.
10. **K. Todros** and A. O. Hero, "Measure-Transformed Quasi-Maximum Likelihood Estimation," *IEEE Trans. Signal Processing*, vol. 65, no. 3, pp. 748-763, Feb. 2017.
11. N. Shlezinge, **K. Todros**, and R. Dabora, "Adaptive filtering based on time-averaged MSE for cyclostationary signals," *IEEE Trans. Communications*, vol. 65, no. 4, pp. 1746-1761, Apr. 2017.
12. N. Halay and **K. Todros**, "Plug-in measure-transformed quasi likelihood ratio test for random signal detection," *IEEE Signal Processing Letters*, vol. 24, no. 6, pp. 838-842, Jun. 2017.
13. N. Halay, **K. Todros**, and A. O. Hero, "Binary hypothesis testing via measure-transformed quasi likelihood ratio test," *IEEE Trans. Signal Processing*, vol. 65, no. 24, pp. 6381-6396, Dec. 2017.
14. N. Shlezinger and **K. Todros**, "Performance analysis of LMS filters with non-Gaussian cyclostationary signals," *Signal Processing*, vol. 154, pp. 260-271, Jan. 2019.
15. **K. Todros**, "Robust composite binary hypothesis testing via measure transformed quasi score test," *Signal Processing*, vol. 155, pp. 202-217, Feb. 2019.
16. N. Halay and **K. Todros**, "MSE based optimization of the measure-transformed MUSIC algorithm," *Signal Processing*, vol. 160, pp. 150-163, Jul. 2019.
17. N. Yazdi and **K. Todros**, "Measure-transformed MVDR beamforming", *IEEE Signal Processing Letters*, vol. 27, pp. 1959-1963, Nov. 2020.
18. Y. Sorek and **K. Todros**, "Robust spectrum sensing via probability measure transform", *IEEE Trans. Signal Processing*, vol. 69, pp. 4023-4038, June, 2021.
19. Y. Eder and **K. Todros**, "Robust two-sample location testing via probability measure transform", *IEEE Trans. Signal Processing*, vol. 69, pp. 4724-4739, June, 2021.

## Conferences:

### (a) Invited presentations:

1. **K. Todros** and A. O. Hero, “Measure-transformed canonical correlation analysis with application to financial data,” Invited presentation in the *IEEE 7th Sensor Array and Multichannel Signal Processing Workshop*, Hoboken, NJ, U.S.A., June 2012.
2. **K. Todros**, “Learning to estimate under transformed probability measures,” Invited presentation in the *Afeka conference for speech processing*, Herzliya, Israel, June 2018.
3. Y. Eder and **K. Todros**, “Measure-transformed two-sample Hotelling test,” Invited presentation in the *IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing*, Le Gosier, Guadeloupe, French West Indies, Dec. 2019.

### (b) Refereed conference papers:

1. **K. Todros** and J. Tabrikian, “Blind separation of non-stationary and non-Gaussian independent sources,” *Proc. of IEEEI conference 2004*, pp. 392-395.
2. **K. Todros** and J. Tabrikian, “Application of Gaussian mixture models for blind separation of independent sources,” in *Independent Component Analysis and Blind Signal Separation*, Springer-Verlag Berlin, pp. 382-389, October 2004.
3. **K. Todros** and J. Tabrikian, “Fast approximate joint diagonalization of positive definite Hermitian matrices,” *Proc. of ICASSP 2007 conference*, pp. 1373-1376.
4. **K. Todros** and J. Tabrikian, “A new lower bound on the mean-square-error of unbiased estimators,” *Proc. of ICASSP 2008 conference*, pp. 745-749.
5. **K. Todros** and J. Tabrikian, “A new Bayesian lower bound on the mean square error of estimators,” *Proc. of EUSIPCO conference 2008*.
6. **K. Todros** and J. Tabrikian, “A new lower bound based on weighted Fourier transform of the likelihood ratio function,” *Proc. of SAM workshop 2008*, pp. 428-432.
7. **K. Todros** and J. Tabrikian, “A new lower bound on the mean square error of biased estimators,” *Proc. of IEEEI conference 2008*, pp. 745-749.
8. **K. Todros** and J. Tabrikian, “Hybrid lower bound via compression of the sampled CLR function,” *Proc. of SSP workshop 2009*, pp. 602-605.
9. **K. Todros** and J. Tabrikian, “On order relations between lower bounds on the MSE of unbiased estimators,” *Proc. of ISIT conference 2010*, pp. 1663-1667. **Best student paper finalist.**
10. **K. Todros** and J. Tabrikian, “Achievable MSE lower bounds in non-Bayesian biased estimation,” *Proc. of SAM workshop 2010*, pp. 117-120.
11. **K. Todros** and A. O. Hero, “Measure-transformed canonical correlation analysis with application to financial data,” *Proc. of SAM workshop 2012*, pp. 361-364.

12. **K. Todros** and A. O. Hero, "Robust measure-transformed MUSIC for DOA estimation," *Proc. of ICASSP 2014*, pp. 4190-4194.
13. **K. Todros** and A. O. Hero, "Measure-transformed quasi maximum likelihood estimation with application to source localization," *Proc. of ICASSP 2015*, pp. 3462-3466.
14. **K. Todros** and A. O. Hero, "Measure-transformed quasi likelihood ratio test," *Proc. of ICASSP 2016*, pp. 4259-4263.
15. N. Shlezinger, **K. Todros**, and R. Dabora, "Adaptive LMS-type filter for cyclostationary signals", *Proc. of ISWCS 2016 symposium*, pp. 37-41.
16. N. Halay, **K. Todros**, and A. O. Hero, "Measure-transformed quasi likelihood ratio test for Bayesian binary hypothesis testing," *Proc. of SSP workshop 2016*, pp. 1-5.
17. **K. Todros**, "Measure-transformed Gaussian quasi score test," *Proc. of EUSIPCO 2017*, pp. 2115-2119.
18. N. Halay and **K. Todros**, "Performance enhancement of the measure-transformed MUSIC algorithm via MSE based optimization," *Proc. of ICASSP 2016*, pp. 5187-5191.
19. **K. Todros**, "Measure-transformed Gaussian quasi score test in the presence of nuisance parameters," *Proc. of EUSIPCO 2019*.
20. Y. Eder and K. Todros, "Measure-transformed two-sample Hotelling test," *Proc. of CAMSAP 2019*, pp. 256-260.
21. Y. Sorek and K. Todros, "Measure-transformed covariance test for robust spectrum sensing," *Proc. of ICASSP 2021*, pp. 4970-4974.

### Patents:

1. A. Geva, **K. Todros**, A. Pressman, B. Levy, and A. Mergy, "Self-adaptive system for the analyses of biomedical signals of a patient," US 20040073098, April 2004.
2. A. Geva, **K. Todros**, B. Levy, D. Solomon, and D. Kerem, "Adaptive prediction of changes of physiological/pathological states," US 20040230105, November 2004.
3. **K. Todros**, B. Levy, Y. A. Novodvoretz<sup>T</sup>, and A. Geva, "Sleep quality indicators," US 20090292215, November 2009.
4. **K. Todros**, A. Geva, and D. Resifeld, "Sleep staging based on cardio-respiratory signals," US 20060111635, May 2006.
5. A. Halperin, L. Tsoref, Y. Gross, D. L. Lange, J. H. Ben-Ari, A. Averbouch, **K. Todros**, R. Karasik, G. Meger, and Y. Zieherman, "Monitoring, predicting and treating clinical episodes," US 20080275349, June 2008.

## Research Grants:

1. **K. Todros** and A. O. Hero, “Measure-transformed lower order multivariate analysis,” U.S.A-Israel Binational Science Foundation (BSF), Oct. 2015–Oct. 2018.
2. **K. Todros**, “Composite binary hypothesis testing under transformed probability measures,” Israeli Science Foundation (ISF), Oct. 2017–Oct. 2021.

## Research Interests:

Statistical signal processing and machine learning with focus on the following topics:

- Semi-parametric detection and estimation.
- Adaptive filtering.
- Sensor array and multichannel signal processing.
- Blind source separation.
- Biomedical signal processing.