



greenet



# Second GreenNet Seminar



From the 3<sup>rd</sup> to the 6<sup>th</sup> of July 2012

1<sup>st</sup> Day - 3<sup>rd</sup> July

## Seminar 5

Module I	Speaker	Tentative Title	Syllabus
Block 1 14.00-15.30	Nicola Marchetti	Introduction to CR networks	<ol style="list-style-type: none"><li>1. CR basics</li><li>2. From CR to CR networks</li><li>3. CR networks as part of self-organising networks</li></ol>
15.30-16.00		Coffee Break	
Block 2 16.00-17.30	Frank Fitzek	Cooperation Competition and Cognition In Wireless Networks (1/2)	<ol style="list-style-type: none"><li>1. Fundamentals of cooperative/multihop networking</li><li>2. Introduction of the concept of distributed diversity</li></ol>
17.30-18.00		Coffee Break	
Block 3 18.00-19.30	Frank Fitzek	Cooperation Competition and Cognition In Wireless Networks (2/2)	<ol style="list-style-type: none"><li>1. Fundamentals of spectrum sensing</li><li>2. On the usefulness/need of cooperation</li></ol>

2<sup>nd</sup> Day – 4<sup>th</sup> July

<i>Module I</i>	Speaker	Tentative Title	Syllabus
Block 4 09.00-10.30	Nicola Marchetti	Information theoretical aspects of CR networks	<ol style="list-style-type: none"> <li>1. Classical vs. cognitive channels</li> <li>2. Small vs. large networks</li> <li>3. Spectrum interweave/underlay/overlay</li> </ol>
10.30-11.00		Coffee Break	
Block 5 11.00-12.30	Nicola Marchetti	Cognitive heterogeneous networks	<ol style="list-style-type: none"> <li>1. Small cells and heterogeneous networks</li> <li>2. Self-organisation in heterogeneous networks</li> <li>3. Frequency-domain cognitive techniques</li> <li>4. Cognitive techniques exploiting other physical domains</li> </ol>
12.30-14.00		LUNCH	
Block 6 14.00-15.30	Nicola Marchetti	Integrated optical-wireless cognitive networks	<ol style="list-style-type: none"> <li>1. Integration at layers 1-2-3</li> <li>2. Integrated dynamic spectrum management</li> <li>3. Inter-cell interference coordination</li> <li>4. Coordinated multi-point</li> </ol>
15.30-16.00		Coffee Break	
Block 7 16.00-17.30	Hamidou Tembine	Game theory for cognitive radio (Part I): Basics of game theory	<ol style="list-style-type: none"> <li>1. One-shot games</li> <li>2. Solution concepts               <ol style="list-style-type: none"> <li>a. Saddle point</li> <li>b. Cournot equilibrium</li> <li>c. Nash equilibrium</li> <li>d. Subgame perfect equilibrium</li> <li>e. Stackelberg solution</li> </ol> </li> <li>3. Static cooperative games               <ol style="list-style-type: none"> <li>a. Bargaining and fairness solutions;</li> <li>b. Strong Nash equilibrium;</li> <li>c. Core and variants;</li> <li>d. Shapley value.</li> </ol> </li> </ol>
17.30-18.00		Coffee Break	
Block 8 18.00-19.30	Hamidou Tembine	Game theory for cognitive radio (Part I): Game theory in cognitive radio networks	<ol style="list-style-type: none"> <li>1. Dynamic game theory:               <ol style="list-style-type: none"> <li>a. Who is the decision maker in cognitive radio networks?</li> <li>b. Is dynamic hierarchical game theory relevant in cognitive radio networks?</li> <li>c. Case studies: Spectrum access games (Physical layer) in CRN</li> <li>d. Medium access control (MAC layer) in CRN</li> <li>e. Spectrum auction in CRN</li> </ol> </li> <li>2. Distributed strategic learning in cognitive radio networks.</li> </ol>

			<ul style="list-style-type: none"> <li>3. Evolutionary coalitional games in cognitive radio networks.</li> <li>4. Random matrix games in cognitive radio networks.</li> </ul>
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### 3<sup>rd</sup> Day – 5<sup>th</sup> July

#### Seminar 6

<i>Module II</i>	<i>Speaker</i>	<i>Tentative Title</i>	<i>Syllabus</i>
Block 1 09.00-10.30	Gerhard Bauch	MIMO Basic I	<ul style="list-style-type: none"> <li>1. Introduction to MIMO-Systems, potential of MIMO systems, principles of transmission strategies</li> <li>2. MIMO channel models</li> <li>3. MIMO channel capacity</li> <li>4. Diversity methods and space-time codes</li> <li>5. Spatial multiplexing: Transmission strategies and detectors (ML, Zero forcing, MMSE, BLAST)</li> <li>6. Open-Loop and Closed-Loop Single-User MIMO schemes in 3GPP-LTE and LTE-Advanced</li> </ul>
10.30-11.00		Coffee Break	
Block 2 11.00-12.30	Gerhard Bauch	MIMO Basic II	<ul style="list-style-type: none"> <li>1. Introduction to multi-user MIMO</li> <li>2. Transmit Precoding</li> <li>3. Theoretical bounds of Multi-User MIMO</li> <li>4. Multi-User MIMO with imperfect channel state information at the transmitter (quantized feedback)</li> <li>5. Multi-user MIMO in LTE and LTE-Advanced</li> </ul>
12.30-14.00		LUNCH	
Block 3 14.00-15.30	Ali Ghayeb	Cooperation & Relaying	<ul style="list-style-type: none"> <li>1. Intro to Cooperative communications</li> <li>2. Challenges in cooperative communications</li> <li>3. Relaying strategies</li> <li>4. Capacity and info rates</li> <li>5. Relay selection</li> <li>6. Cooperative communications with system imperfections</li> </ul>
15.30-16.00		Coffee Break	
Block 4 16.00-17.30	Ali Ghayeb	Advancements in Network Coded Systems	<ul style="list-style-type: none"> <li>1. Intro to network coding</li> <li>2. Distributed concatenated coding and iterative decoding</li> <li>3. Controlling error propagation in cooperative networks</li> <li>4. Joint threshold-based relaying and ML detection</li> <li>5. Joint iterative compressive estimation and decoding in two-way relay channels</li> </ul>
19:00		SEMINAR DINNER	Vittoria, 9 George IV Bridge, Edinburgh, EH11EN

4<sup>th</sup> Day – 6<sup>th</sup> July

<b>Module II</b>	<b>Speaker</b>	<b>Tentative Title</b>	<b>Syllabus</b>
<b>Block 5 09.00-10.30</b>	<b>John Thompson</b>	<b>Energy Efficient MIMO</b>	<ol style="list-style-type: none"> <li>1. Efficient Transmission Techniques developed within MVCE "Green Radio" project</li> <li>2. Detection Algorithms</li> </ol>
<b>10.30-11.00</b>		<b>Coffee Break</b>	
<b>Block 6 11.00-12.30</b>	<b>Harald Haas</b>	<b>Spatial Modulation-MIMO</b>	<ol style="list-style-type: none"> <li>1. Introduction to spatial modulation</li> <li>2. Fractional bit-encoded spatial modulation</li> <li>3. Sphere decoder for spatial modulation</li> <li>4. Multiuser spatial modulation</li> </ol>
<b>12.30-14.00</b>		<b>LUNCH</b>	
<b>Block 7 14.00-15.30</b>	<b>Dr. Stephan Rein</b>	<b>Basics of Network Coding I</b>	<ol style="list-style-type: none"> <li>1. Introduction to Network Coding using the "Butterfly"</li> <li>2. Basic of network coding using XOR operations</li> <li>3. Network Coding for wireless Systems</li> <li>4. COPE</li> <li>5. XOR based setups</li> </ol>
<b>15.30-16.00</b>		<b>Coffee Break</b>	
<b>Block 8 16.00-17.30</b>	<b>Dr. Stephan Rein</b>	<b>Basics of Network Coding II</b>	<ol style="list-style-type: none"> <li>1. Random Linear Network Coding</li> <li>2. Comparison of RLNC and XOR</li> <li>3. Energy consumption and NC</li> </ol>