which model gives the minimum AIC magnitude. To compare the fitted models, we also report the estimated 95% confidence intervals. For each model parameter, we averaged across all subjects. For each model parameter, we also estimated the Akaike Information Criterion (AIC). For each subject, we identified the model with the lowest AIC across trials.

To account for the differences in model complexity, we also included the Voluntary Assistance (V) and the AIC of the model fitting in different subjects, we looked at the correlation between the model's rate of recovery and the change percentage in the Fugl-Meyer score observed between the beginning and the end of the rehabilitation trials. To understand the relation between the subject's level of impairment and the observed performance, we compared model parameters for each subject with the change percentage in the Fugl-Meyer score and the change percentage in the Ashworth scale.

Finally, to understand whether the long-term effect of robotic assistance, and presence/absence of vision affects the changes of performance.

Correlation between model parameters and the subject's initial impairment and response to treatment was not satisfied; Pearson's correlation coefficient was used to test whether recovery was performed by either movement performance or movement error. In all cases, we took Spearman's correlation coefficient.

To relate the subjects' initial impairment and the change percentage in Fugl-Meyer score observed between the beginning and the end of the rehabilitation trials, we looked at the correlation between the model's rate of recovery and the change percentage in the Fugl-Meyer score.
COMPUTATIONAL NEUROREHABILITATION

• concept coined by Nicolas Schweighofer (http://pt.usc.edu/labs/cnrl/)

• understanding and enhancing sensorimotor learning, with application to neurorehabilitation:
  - to develop computational models of motor learning and plasticity in the healthy and affected central nervous system
  - to optimise learning (e.g. via optimal schedules) in healthy and impaired subjects
COMPUTATIONAL NEUROREHABILITATION

• based on neurorehabilitation, motor control research and new rehabilitation technology tools (sensor-based systems, robots)

• first colloquium on this emerging field at Château de la Bretesche, in Bretagne, France, on 30/6-3/7 2012

• to develop this field through education, e.g. this winter school
understanding and enhancing sensorimotor learning, with application to neurorehabilitation at various levels (L Ting):

- thorough analysis and interpretation of clinical data (e.g. G Kwakkel)

- phenomenological models using sensors data (kinematics, force, EMG, etc.) (e.g. V Sanguinetti)

- through combined physiology and brain imaging (e.g. D Turner, H Rossiter)

- through computational models of motor recovery (e.g. N Schweighofer)

- necessary methods: E Guigon, A d’Avella, E Burdet
WINTER SCHOOL ON COMPUTATIONAL METHODS FOR NEUROREHABILITATION

• to learn theoretical and practical aspects of motor control and modelling for neurorehabilitation

• Committee: Sivakumar Balasubramanian, Etienne Burdet, Thierry Keller, Nathanael Jarrassé, Andrew Pennycott, David Ram, Vittorio Sanguineti, Duncan Turner

• 40 participants and 19 speakers & mentors
FINANCIAL ASPECTS

• The Cost Action TD1006 covers most of the speakers travel and accommodation

• We have spread the remaining costs, i.e. basically your accommodation, equally amongst the participants

• 6 speakers will pay the hotel and travel and will be reimbursed by the COST Action: A d’Avella, S Balasubramanian, E Guigon, T Keller, G Kwakkel, V Sanguineti

• 30 European “students” should pay us 300 Euros (now!?, so that we can pay the hotel) and will be reimbursed for this by the Cost Action

• Please contact Thierry if you are in this case but did not receive an invitation from the Cost Action
PROGRAMME: TUESDAY-FRIDAY

• breakfast: 7h30-8h30

• lectures: 8h30-12h30

• afternoon: ski, spa, Kuchen, etc.

• dinner: 18h30-19h30

• mini-project: 19h30-22h30
PROGRAMME

• Tuesday: mechanisms of motor recovery

• Wednesday: computational motor control methods

• Thursday: models to improve therapy

• Friday: mini-project results, outlook
TUESDAY:
MECHANISMS OF MOTOR RECOVERY

• Understanding motor recovery post stroke (Gert Kwakkel, Vrije Universiteit, Amsterdam)

• Mechanisms of brain recovery (Duncan Turner, University of East London)

• Muscle synergies and neuromotor recovery (Andrea d’Avella, Fondazione Santa Lucia)

• Mini-projects (Nathanael Jarrassé, CNRS)
WEDNESDAY: COMPUTATIONAL MOTOR CONTROL METHODS

- Making sense of muscle activity in sensorimotor deficits and neurorehabilitation (Lena Ting, Emory University and Georgia Tech)

- Motor adaptation and motion optimisation (Etienne Burdet, Imperial College London)

- Reinforcement learning, reward, optimal control (Emmanuel Guigon, Université Pierre & Marie Curie)

- Sensor-based assessment of the sensorimotor function (Sivakumar Balasubramanian, Tecnalia)
THURSDAY: MODELS TO IMPROVE THERAPY

• Modelling cortical reorganisation following stroke (Holly Rossiter, University College London)

• Neuromotor recovery at functional level (Vittorio Sanguineti, Università Degli Studi di Genova)

• Use of arm induced by therapy (Nicolas Schweighofer, University of Southern California)
FRIDAY:

- 8h30-10h30: Results of lab activities: All attendees
- 11h-12h: Panel discussion on computational neurorehabilitation: All speakers